W. R. Dudley

THE

BOTANICAL GAZETTE.

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William R. Dudley

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Botanical Gazette.

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Editorial.—WE make no promises for Vol. VII, except that it shall be better than any before it. With the last volume the catalogue of Indiana plants was published in the form of extras. Some material is now in hand to be published with the present volume, of even more general interest, and we feel confident that the one dollar subscription will be thought but a small return for value received.

M. CRIE, before the Academy of Sciences of Paris, in a paper "On some new cases of phosphorescence in plants," reported for the first time emission of light in certain of the Ascomycetes.

REV. A. B. LANGLOIS has just published a list of the very interesting plants found in Plaquemines County, La. The list numbers 456, and of course the author does not claim that it is complete.

MR. J. F. JAMES, of the Cincinnati Society of Natural History, has, in the last Journal of that Society, a paper on the variability of the acorns of *Quercus macrocarpa*. He has sketched eight very different looking acorns as belonging to this single species.

MR. AUG. FOERSTE, of Dayton, Ohio, writes that Mr. Samuel Weller, a farmer near Centreville, brought him a *Lycoperdon giganteum*, 20 inches in diameter, with a vertical diameter of 15 inches. It weighs 17¾ pounds and was just beginning to turn yellowish green.

MR. JOHN ROBINSON has published a list of the dates of flowering of trees and shrubs in Eastern Massachusetts in 1880. Although the Red and White Maples showed flowers in January on account of a few warm days, the season of flowers did not begin before the first of April.

THE GENERA OF COMPOSITÆ changed by Bentham and Hooker are as follows: *Maruta* becomes *Anthemis*, *Leucanthemum* becomes *Chrysanthemum*, *Cacalia* becomes *Senecio*, *Lappa* becomes *Arctium*, *Cynthia* becomes *Krigia*, *Mulgedium* becomes *Lactuca*, *Nabalus* becomes *Prenanthes*.

WE TAKE PLEASURE in calling the attention of our subscribers to the advertisement of W. N. Suksdorf. The plants he offers for sale so reasonably are very fine, as some large bundles just received abundantly testify. He has many new species, though he is in doubt how long species are considered new.

MR. A. H. CURTISS has just sent out Fascicle V of his invaluable Florida collections. It contains several new species and very many not in Dr Chapman's Manual. No sooner is the work off hands than this indefatigable collector is off again to South Florida, whose flora he intends to complete with Fascicle VI.

THE FULL TEXT of Sir Joseph D. Hooker's address on "Geographical Distribution," before the Geographical Section of the British Association last year at York, has come to hand and proves to be what all expected, a complete and compact review of the subject. Much more information is given in its dozen pages than can sometimes be gleaned from whole volumes of more pretentious style.

MR. S. B. BUCKLEY has notes upon some Texas oaks in the Proc. Phil Acad., Part II, 1881. His *Quercus Durandii*, which Dr. Engelmann regards as one of the varieties of *Q. undulata*, he still holds as good, though in spite of a fling at closet workers, it takes a good deal of temerity to dispute Dr. Engelmann's decisions among the oaks. In the same paper *Q. Texana* is reduced to a variety of *Q. rubra*, but by others it is regarded as *Q. palustris*.

IN THE TORREY BULLETIN for December, Mr. William Trelease has a valuable paper on the "Fertilization of Scrophularia," and in conclusion makes the following summary: 1. The flowers are adapted by their coloring, odor, nectar, form and protogyny to cross-fertilization by wasps; 2, in case the insects fail to do their part, self-fertilization is fairly well assured, though we have known it to fail occasionally; 3. the existence of species which are adapted to close fertilization without a previous chance for crossing remains to be proved; 4. cleistogene flowers are produced, so far as we know, by only one species, *S. arguta*.

PROF. JOHN EARLE, of the University of Oxford, has written a little book upon "English Plant-Names from the Tenth to the Fifteenth Century." A single sentence will tell its general bearing. "Plant names are often of the highest antiquity and more or less common to the whole stream of related nations. Could we penetrate to the original suggestive idea that called forth the name, it would bring valuable information about the first openings of the human mind towards Nature; and the merest dream of such a discovery invests with a strange charm the words that could tell, if we could understand, so much of the forgotten infancy of the human race."

MR. JOHN ROBINSON read a paper before the Mass. State Board of Agriculture upon the subject, "Ornamental Trees for Massachusetts Plantations," which has just appeared in pamphlet form. Mr Robinson sums up his principal points as follows: I. That, for planting in New England, our own New England trees are, with few exceptions, the best. II. That, in addition to the New England trees, we can safely make use of the many beautiful and useful trees which abound in the forests of the Middle States and the Alleghany Mountains; and that to these Eastern species may be joined a few trees of unsurpassed beauty in the Rocky Mountain region. III. For exotic species, with which to add variety and interest to a plantation, we must look to Eastern Asia rather than to Western Europe.

MR. GEO BENTHAM, last November, read before the Linnean Society a paper entitled "Notes on the *Gramineæ*," of which an abstact appears in the last *Journal of Botany*. When Mr. Bentham speaks we all listen. In this paper, the author first mentions the fact of many bad species having been established. Then is given a sketch of the

views of Linnæus, Robert Brown, whose name seems to be synonymous with "sagacity," Kunth, Trineus, Nees von Esenbeck, etc. The statement that Steudel's "Enumeratio Plantarum Glumacearum" is the worst production of the kind he has ever met with is very instructive. The law of priority is sensibly set aside in certain well known genera, and *Sorghum* is retained rather than the earlier *Blumenbachia*, *Cynodon* instead of *Fibrichia*, etc. The arrangement in tribes is as follows:—

A. PANICEÆ.

Tribus 1. *Paniceæ.*
" 2. *Maydeæ.*
" 3. *Oryzeæ.*
" 4. *Tristegineæ.*
" 5. *Zoysieæ.*
" 6. *Andropogoneæ.*

B. POACEÆ.

Tribus 7. *Phalarideæ.*
" 8. *Agrostideæ.*
" 9. *Isachneæ.*
" 10. *Aveneæ.*
" 11. *Chlorideæ.*
" 12. *Festuceæ.*
" 13. *Hordeæ.*
" 14. *Bambusæ.*

Eleocharis dispar, n. sp.—Culms slender, roundish, several from the same root, erect or ascending, or with some of the shorter ones recurved, very unequal in length, ¼–8 inches high, mostly 1–4 inches. Roots fibrous, tufted, annual. Spikes ovate to ovate-oblong, obtuse, 1–3 lines long, 15 to 40 flowered; scales thickish, firm, oval, obtuse, brown with paler margins; keel green, becoming lighter colored with age. Stamens 2, style 2 cleft. Bristles 6–8, downwardly barbed, mostly shorter than the achenium, but variable in length. Achenium biconvex, obovate, shining, brown to nearly black, roughened with oblong striae, tipped with a flattened or saucer-shaped tubercle.

In sand or gravel near the margins of "sloughs," August and September, Whiting, Lake Co., Ind.

The plant may mature its fruit in shallow water, but during the two seasons in which it has been observed, it was found only in the dry bottom of a shallow pond. It was first detected in August, 1880. Looking for it in the early part of July of the present year, when the bottom of the pond was covered with water, the plants had apparently started, as was indicated by tufts of short stems that could not be identified with any other plants growing there. It is most like *E. multiflora*, Chapman, a Florida plant, but differs in several characters, particularly in the presence of bristles and fewer flowers in a head. One of the most striking peculiarities is the remarkable difference in the length of the culms, some of the heads being scarcely above the surface of the ground, or nearly sessile on the root, on stems barely ¼ of an inch long, while other stems from the same root may be 8 inches high. Since the short stems bear ripe fruit, they have evidently attained their growth. The plant seems to germinate in the water, but to mature its fruit when the water fails.—E. J. HILL, *Englewood, Ill., Dec., 1881.*

Notes on Western Conifers.—In another publication I intend to give a full account of the observations on Coniferæ made in the Pacific States, when with Prof. Sargent and Dr. Parry I explored their forests, but it seems proper that I should not withhold any longer the principal results arrived at.

Abies amabilis, (Douglas) Forbes, is not a variety of *A. grandis* as I had assumed, but a very distinct species peculiar to the higher mountains of the Cascade Range from Oregon to British Columbia. It is easily recognized by its dense, dark green, glossy leaves, very white underneath, usually emarginate, but on the fertile branchlets acute; by its large very thick purple cones and oblancolate acuminate bracts.

Abies nobilis, (Douglas) Lindley, is peculiar to the higher mountains of Oregon and has not yet been found in California nor, as far as I can learn, in Washington Territory. Its grooved leaves crowded on the branchlets, and its large purple cones with long exsert recurved bracts, well characterize it. The tree on Mount Shasta which has gone by this name (also in the Flora of California) is distinguished by its quadrangular leaves, keeled on the upper side; its large cones considerably resemble those of *nobilis* and have often, not always, exsert and recurved bracts; it is a form of *A. magnifica* Murr., the common Red Fir of the Californian Sierras, which has bracts normally enclosed.

Pinus reflexa, n. sp., (*P. flexilis* var. *reflexa*, Eng. in Rothrock's Rep. Bot. Exp. Wheeler) proves to be quite distinct from *flexilis*, not only by the reflexed scales of the cone but also and principally by the long peduncled cylindric female aments, erect in the first, recurved in the second year, which associate it with the true *Strobi*, while the large wingless seeds distinguish it from the other species of that section.

P. albicaulis, Eng., is specifically distinguished from *P. flexilis* by its subglobose purple cones with short, thick scales and its thin white at last scaly bark.

P. Chihuahuana, Eng., observed by us in the Arizona Mountains, proves to be of peculiar interest as maturing its cones in the third year, the only American species with this character, which I have found only once more in the Mediterranean *P. Pinea*.

P. Jeffreyi, Murr., holds its characters well wherever we have seen it from the mountains west of Mt. Shasta, where it was first discovered, down to the San Bernardino Mountains, affecting more particularly the eastern slopes. The glaucous branchlets with pleasantly aromatic fragrance, thinner glaucous foliage, the great size of the cones with thin, spiny recurved mucro on the scales, large seeds and more numerous cotyledons, distinguish it from *P. ponderosa* which has brownish-green branchlets with a turpentine odor and dark green coarser foliage.

Pinus Arizonica, Eng., has also been repeatedly collected by us as well as by subsequent explorers, and the question has been agitated whether it may not be also a form of *P. ponderosa*. The fact is that five-leaved forms of this species do occur on the Californian Sierras

(Lemmon) and on the Arizona Mountains (Lemmon, Pringle), but the larger number of leaves is here a casual occurrence; the branchlets show the brown-green color noticed above, the leaves are dark green and have the structure described by me in Wheeler's Report. *P. Arizonica* has glaucous branchlets, thinner leaves, constantly in fives, and of different structure; its cones are thicker and shorter with much more prominent umbos, but not much weight can be put on this last character.—G. ENGELMANN.

Some Additions to the North American Flora.—STELLARIA OBTUSA, n. sp.—Glabrous, stems weak, prostrate, much branched, leaves subsessile triangular-ovate acute smooth edged 1–nerved and the delicate reticulated veins uniting into distinct intramarginal nerves; flowers single, pseudo-axillary, peduncles nearly as long as the leaves patulous or recurved in fruit, sepals ovate obtuse nerveless scarcely membranaceous on the margin, petals (always ?) wanting; capsule ovate obtuse scarcely exsert, seeds (under the lens) covered with oblong linear pectinate tubercles, dark brown.—Western Colorado on the tributaries of Gunnison River, alt. 9,000 to 10,000 feet, in damp grounds, T. S. Brandegee. Closely allied to *S. crispa* of the northwest but readily distinguished by the form of the sepals, the capsule and the seeds; in that species the sepals are lanceolate, broadly margined and 3–nerved, the capsule exsert, acutish, the seeds larger, reddish and nearly smooth. *S. borealis*, with which *crispa* has sometimes been united, has a similar calyx, capsule and seeds, but is distinguished by its elongated lance linear leaves, finely serrulate on the edge, the intramarginal nerve very indistinct.

CAMPANULA PLANIFLORA, n. sp.—Erect, glabrous, a finger to a span high from a filiform rootstock bearing similar subterranean stolons, usually 1–flowered; leaves lanceolate to linear-lanceolate 1 to 2 inches long, 2–3 lines wide, the lowest ones sometimes broader, all more or less dentate or denticulate; flower erect, calyx turbinate, lobes lance-linear mostly dentate, several times longer than the tube and exceeding the tube of the corolla; corolla shallow, wide open, 4 times wider than deep, divided to the middle or beyond; lobes ovate acute spreading or at length reflexed; capsule erect ovate or turbinate as long as the connivent calyx lobes or shorter, opening at top.—*C. Langsdorffiana* of the Rocky Mountain floras, not Fischer; *C. Scheuchzeri*, Gray Flora in part.

Common in Subalpine meadows, near streamlets, at an elevation of 7000 9000 feet Colorado; Clear Creek valley, Middle and South Parks. The large and very shallow flowers of a reddish-purple color and the filiform branching rootstocks distinguish this species at once from *C uniflora* with which I had united it (this journal, 6.238). The usually erect stems become sometimes decumbent and several flowered when overgrown. *C. uniflora* is found only on bare alpine slopes, usually with *Dryas* and *Silene acaulis* at about 12000 to 13000 feet alt. It grows from a stout several-headed rootstock, bears deeply campanulate mostly horizontal flowers ½ inch in length

and an erect fruit; the leaves are usually marked with a few small glandular semi-transparent teeth in notches.

ERIOGONUM ALPINUM, n. sp.—Few heads from a very stout caudex; the whole plant (except the flowers) densely white tomentose; leaves nearly orbicular, 1 inch wide, attenuate at base into a petiole of the same length; scape (about 4 inches high) with a verticil of 3 or 4 lanceolate, foliaceous bracts above its middle; umbels solitary, involucrum broadly campanulate (3 lines wide) with 9 to 12 short, erect teeth; flowers very numerous, attenuate at base, glabrous in and outside, yellow, 2½ lines long.—On Scotts Mountain, Northern California, together with *Campanula scabrella* (see page 237) on stony ridges about the timber line, G. E. The large single yellow heads look very much like those of some alpine composite; the plant is a counterpart to the glabrous rose-flowered *E. pirolæfolium*, Hook., found on the opposite Mount Shasta in similar situations.

JUNCUS CANALICULATUS, n. sp.—A coarse plant of the section *Graminei*, 3 feet or more high from a cespitose rootstock with stout terete stems and numerous concave or channeled leaves 2 or 3 of them with auricled sheaths on the stem; heads 3 to 8-flowered on slender branches in a decompound rather contracted panicle; flowers light greenish-red over 2 lines long, sepals of nearly equal length with membranaceous margins, inner acute, outer ones acuminate; stamens 6, two-thirds the length of the sepals, long linear red-brown anthers longer than the filaments; ovary attenuated into a slender style bearing very long exsert stigmas, 1 celled; fruit and seed unknown.—San Bernardino Mountains at 4,000 feet alt. S. B. and W. F. Parish. Abundantly distinguished from the allied *J. marginatus*, witn which it has in common the brown-red anthers, otherwise rare in the genus, by the stouter habit, the long coarse deeply channeled leaves, larger flowers, acute sepals, acuminate ovary, long style and stigmas.—G. ENGELMANN.

Woodsia Plummeræ, n. sp.—Root-stock short; stalks 1–2 inches long stramineous, chaffy; fronds bright green, 4–8 inches long, lanceolate-elliptical, membranaceous, beset with gland tipped leaves, pinnate, or nearly bi-pinnate; pinnæ approximate except the lowest, very short peduncled, lanceolate, attenuate to an obtuse point, the lowest cuneate ovate, middle ones longer, of the same width at base, all pinnately parted; segments long-oblong, elliptical, crenately toothed with about five teeth on a side, dentate at apex, ciliate with the peculiar glandular hairs of the species; veins forking, free, mostly alternate; sori terminal on the veinlets nearer the margin than the midrib; spore cases pearly gray with brown rings; spores amber colored round-ovate, the cell-wall deeply wrinkled; indusium minute lacerate fimbriate, ciliate with glandular hairs

This lovely fern is closely allied to forms of *W. obtusa* but differs from that species at several points. The fronds are bright green, almost diamond-shaped. The pinnæ are not remote except the lowest but approximate, not obtuse but long-attenuate from a broad base.

The segments are longer, narrower and with more teeth, all conspicuously ciliated with stalked glands, as are also the lobes of the indusium.

On the north side of a high peak of the Chirricahua mountains, near Apache Pass and Ft. Bowie, S. E. Ariz., around moist granite rocks, in shade. Plants solitary, with several fronds, all fertile.

September 24, 1881, J. G. and Mrs. S. P. Lemmon.

Dedicated to Mrs. Lemmon, whose maiden name is Sara A. Plummer and whose devotion to science, arduous labors and daring heroism while botanizing in the land of the Apache, entitles her to high honors and this timely recognition.—J. G. LEMMON.

Another Botanical Laboratory.—One result of Dr. Rothrock's visit to Europe last year has been the creation of a well equipped botanical laboratory in Philadelphia at the University of Pennsylvania. This is, to be sure, devoted more especially to the medical aspects of botany, and forms a prominent feature in the school which that institution has opened for the purpose of fitting young men to study medicine; but it also aims at giving a thorough grounding in microscopic and in general systematic botany.

Probably but few college trustees are aware how general the desire for biological instruction has become. In evidence of this we may say that the laboratory under Prof. Rothrock was started in doubt as to whether there would be a single student to avail himself of its advantages; yet, though it is not three months old, it has its capacity taxed to the utmost and urgent demands for more room and instruments are being made. Not only do we find there the ordinary student and those who are preparing for medicine specially, but teachers, physicians, students of architecture and aspirants for naval medical honors, each week bringing in new applicants. In a word, it bids fair to be a first-class success, and the question may now be fairly put to the authorities of other institutions, is it not time for every college that claims respectable standing to furnish such laboratories?

Hieracium aurantiacum.—Besides the localities already mentioned, I learn that Mr. Redfield, of the Philadelphia Academy of Natural Sciences, collected it also on the Catskills, in another locality besides that of Miss Mary Cope, and Mr. Chas. J. Sprague, of Boston, found it in the summer of 1880 in St. Alban's, Vermont. Mr. Sprague found it covering large patches of bare hilltops where the grass was thin and scant, and in what appeared to be old fields, and "seemed to have taken full possession." From this expression it is clearly Mr. Sprague's idea that it was not indigenous there, and this appears to be the sum of all I can gather from other collectors. It has not been found in any place where it was unlikely not to have been introduced. It is still a matter of interest as to how it was brought from the seed sowed. I do not know of its being anywhere cultivated in our country, though its beauty might claim that distinction, and so doubt whether it will come under the head of an "escape."—THOMAS MEEHAN.

A Reply to Emesby.—EDITOR OF BOTANICAL GAZETTE: My genial critic Emesby, in your last issue, says "*Systematic Botany Nevertheless*," with which I am absolutely in accord, and in proof whereof quote from my previously published paper on *Modes of Teaching*, these words: "Systematic botany must, if it represents a strictly natural system, be founded on a nice appreciation of the entire organization, the life history of the individual and its relation in past and present time to allied plants. *This, then, is the highest, all embracing trend botanical thought can assume.*" Surely there is in that nothing but unqualified respect for systematic botany under whose ægis honored leaders have established a glorious record for our country.

Neither, my good Emesby, have I ventured to dream, much less to suggest that a final system had been attained. I have told how thorough a "*foundation*" Torrey, Gray, Engelmann and Watson have laid, but the superstructure is another question. I can well admit that systematic botany will boil and bubble into no one knows how many changing forms before it comes to the crystalline condition with its angles clear and sharp and its points absolutely fixed. There is ample work for generations of systematists before the high ideal I have above hinted at shall have been attained,

Mr. Darwin was named not to encourage any one in the idea that all could enter the harvest field and return with such a load of sheaves as he, but to show what the productiveness of the field was.

Now then, oh Emesby, friend, why did I write such radical things in that somewhat pointed paper? First, to make those who rest satisfied with the mere name dissatisfied and to lead them to a little fuller study of the plant itself. Second, to protest might and main against colleges that boast of their thorough teaching outfit allowing a student to go away with the idea that our science had no other side than the systematic. I have in a small way started that "*School of Botany*," (and I wish the teacher were more worthy of the kind words Emesby has written of him) and in it I start with microscopic botany, urging that my pupils see for themselves, draw for themselves and come to their own conclusions. After some months in such mental drill, I shall introduce them to systematic botany with the hope that their eyes will be the sharper and their reasoning power the keener for the ordeal that they have passed. Thus I hope to lay a foundation for a better knowledge of many plants and to beg efficiently for the "*highest*, all embracing trend botanical thought can assume,i. e., Systematic Botany. Very sincerely yours,

J. T. ROTHROCK.

The Botanist in Arizona.—This territory is fast becoming the favorite haunt of our more intrepid collectors, for its physical features, while most forbidding so far as comfort is concerned, favor the growth of very peculiar plants. The Lemmons, Pringle, Greene. Vasey, Jones' and James have all been there and nearly all have specimens of the wonderful flora for sale. But when, amidst the comforts of our herbaria, we revel in the riches their carefully prepared bundles bring

to us, we must not forget what they have cost, for nowhere in this country is botanizing accompanied by such discomfort and actual suffering. Nature seems to delight in guarding her treasures well and has surrounded her choicest gifts with difficulty and danger; and as if sand and heat were not sufficient to warn off the intruding botanist in this land of the Apache, the vegetation also puts on a most forbidding aspect and wrings from him a tribute of blood. The last *Californian* contains a spicy account of a "Botanical Wedding Trip" made to this inhospitable region by Mr. J. G. Lemmon and wife. The hardships they endured in their eager search for plants are almost incredible, but the results amply repaid them. Add to intolerable heat, glaring sand and rattlesnakes, the following condition of things, and it will be seen that our plants are dearly bought. "The way was along a sandy creek wash, with patches of boulders and occasional steep ascents, the whole way beset with cacti of varied degrees of formidable armature, from the innocent pin-cushion cactus, that only catches to your feet and clothing with its fishhook spines while the other straight spines tickle you, to the horrid, wide-branching tree cactus, with its long, glistening barbed spines, that completely clothe limbs and buds, the latter being shed off so frequently, and in such abundance, that they form high mounds under the trees, and often are scattered about for many rods. Any of these spines is strong enough to pierce through a cowhide boot-leg; and when it reaches the flesh you are gone. The retrorse barbs cause it to continue entering the more you struggle. The best thing to do is to break it off at once where you can, and let the rest fester and come away with the pus.

"Almost as cruel are the bushes of an acacia, appropriately called "cats's claws," that crowd in the trail, and reach their slender limbs across the way, armed every half inch with pairs of strong, recurved thorns, that tap your veins unawares, and cause you to add drops of blood to the perspiration that drips almost constantly from your person."

"Perhaps no torture known exceeds that produced by attempting to extract these (cactus) spines from human flesh. One of the favorite tortures inflicted upon captive whites by the Apaches is to strip their victims of clothing, tie their hands and feet, then hurl them against these cacti, rolling them with their lances over upon the broken-down branches, until the poor wretches die from the fiendish torment. Animals in Arizona, impelled by hunger or thirst, often expose their noses to these attacks. when they become mad with pain and die amidst frantic efforts to remove the burs. It is the worst country in the world for sheep. I have seen unsophisticated lambs that had caught a bur from lying down. In attempting to remove it with their teeth. the nose had become attached to the side, and death from starvation was inevitable."

So long as such a condition of things exists the average botanist will be perfectly content to pay from seven and a half to ten dollars per hundred species and enjoy them without such an outlay of sweat and blood.

Disposition of Tendrils in the Bud.—In observing a number of cucurbits growing in my garden last season, I noticed that the tendrils were variously arranged previous to their full expansion.

There were three positions, and not far from the same number of species belonging to each sort, with possibly some preponderance in favor of the straight ones. They were either (1) unfolded or straight; (2) rolled from the apex downward upon the upper face, i. e., circinate; or (3) rolled backward from the apex, and the whole coil bent forward upon the upper face so as to make a loop or handle projecting beyond the coil. This last kind might well be called *ansulate*. The straight tendrils were found in balsam-apple, gherkin, teasel and gooseberry cucumbers and the dish-rag plant. They were at first necessarily very short, but in the climbing species soon exceeded the main axis from which they arose. The circinate ones were seen in the squash, pumpkin, wild cucumber (*Echinocystis*) and star-cucumber; and the ansulate in muskmelon, common cucumber, and *Mukia scabrella*. Some species of the genus *Cucumis* have straight and some ansulate tendrils, but the species of the other genera are uniform, so far as observed.—J. C. ARTHUR.

Autumn Color of the Bartram Oak.—It may be of interest to note that the autumn leaves of *Quercus heterophylla* color like the scarlet *Q. coccinea*. The early leaves of the season are more or less entire, but when the plants are growing freely, and make a secondary growth, as vigorous oaks often do, the later leaves much resemble *Quercus coccinea*. Indeed, when mixed it is difficult to separate them. I think with Martindale it is a good species, and that its relationship is with the Scarlet and Black oak.—THOMAS MEEHAN.

The Compound Crystals of Begonia.—A few weeks ago the students n the botanical laboratory of Wabash College were investigating plant crystals. One member of the class was working with the petiole of one of the large leaved Begonias and examining its well known compound crystals. Upon using his reagents to determine their chemical nature, he found his weaker acids slow to produce any effect, and determined, at any rate, to destroy the crystals, drew under the cover glass some undiluted sulphuric acid. Of course the crystals at once responded and began to dissolve rapidly, but the investigator's attention was at once attracted by the fact that the compound crystals had become bundles of raphides. Upon calling my attention to the fact. I directed other members of the class to repeat the experiment, and in every case the compound crystals wasted away to bundles of raphides, lying in the direction of the longer axes of the crystals.

In this connection might be mentioned the fact that the same class found a better display of cystoliths in the stems of the common *Pilea pumila* than in any other plant studied. The cystoliths were very large, lying of course parallel with the fibers of the stem, and

several of them could be brought into one feld under a low power. With a Beck's ¼ objective and A eyepiece some of them had both ends out of the field.—J. M. C.

The Flora of Madagascar.—Madagascar is wonderfully rich in its display of all kinds of life and its natural history has just been considered in some interesting papers published by Mr. J. G. Baker in the *Journal of Botany*. As Prof. Bessey says, this island is only a little more than three-fourths the size of the State of Texas and yet the number of species of flowering plants alone is estimated at from four to five thousand.

Mr. Baker closes his paper with the following summary of the leading characteristics of the Madagascar flora:—

1. The flora of the tropical zone throughout the world is remarkably homogeneous in its general character, and to this general rule Madagascar furnishes no marked exception. There is no well-marked plant type largely developed in the island which is not found elsewhere, and none absent that one might, *a priori*, expect.

2. About one in nine of the genera are endemic, but they are all small genera, mostly belonging to the large natural orders and closely allied to cosmopolitan generic types.

3. There is a close affinity between the tropical flora of Madagascar and that of the smaller islands of the Mascarene group.

4. There is a close affinity between the tropical flora of Madagascar and that of the African continent.

5. There are a few curious cases in which Asiatic types which do not occur in Africa are met with in Madagascar, but these bear a very small numerical proportion to the great mass of the flora.

6. There is a distinct affinity between the flora of the hill-country of Central Madagascar and those of the Cape and the mountain-ranges of Central Africa.

Epiphegus Virginiana.—The *Epiphegus Virginiana* exhibits an entirely different form of parasitic growth from those plants having haustoria or sucking roots The beech root (on which it grows) on being touched by the parasite, sends a branch, or branch-like growth into the latter, through which all its nourishment is carried, causing the death of the root from this point to its end, if not too large, while that above flourishes despite the drain of the parasite. If, however, the root is larger, and there is substance enough after the parasite is supplied, it will live, but will be retarded in its growth.—S. T. FERGUS, *West Chester, Pa.*

Phytolacca decandra L. A prolific case.—In an article in the July Number of the *American Naturalist*, I instanced our Eastern snow bird finding a cache of Pokewort seeds in a deep bank of snow by my garden fence. How the plant got there I do not know, but because of its elegance it was allowed to retain its place. This summer it has attained proportions which exceed anything I have ever seen. The plant threw out ten stems. Nine of these averaged ten

feet in height. The sight presented by the beautiful cylindric racemes of berries is very grand. I was curious to estimate the quantity of this purplish fruit. We counted over 1800 racemes, whose average weight was 1 oz. averdupois each, thus making a little more than 112 pounds of berries on one plant. The robins are feasting daily upon them; and they are welcome, although I hope some will be left for the snow birds.—S. LOCKWOOD, *Freehold, N. J. Oct.* 22, 1881.

A Second Spring in Ark.—This season has been such a peculiar one that "Dame Nature" has become confused.

Vegetation was luxuriant in this region during the spring and early summer months.

Plants put forth rapidly and made a vigorous growth.

There was scarcely any rainfall from June until October.

All the summer and autumn species of plants were dwarfed.

During the continued drouth vegetation assumed a dead like appearance as though killed by frost. Foliage of the trees was dull and shriveled. Meadows and lawns were as brown as stubble fields. The vital forces were apparently suspended, and plants seemed to be taking their periodical rest after a season of activity. The shoots that grew in the spring had the appearance, at the close of the drouth, of wood hardened by the suspension of growth and the approach of winter.

The copious fall of rains set in. A *second* spring arrived and as by magic the earth was transformed into a garden.

Nature was enticed to make a second growth which was scarcely interrupted until the hard freeze on the night of Nov. 19th.

Flower and leaf buds formed by the early spring growth were lured into development by the warm sun and copious showers.

Pear, peach, plum, cherry and apple trees and Japonicas have been in full bloom this fall and on some trees young fruit has formed.

Garden perennials have had a second season of blooming and many summer and fall wild perennial herbs revived and continued to bloom until the freeze.

There will certainly be two layers of woody tissue in the exogens of this region representing the growth of 1881.

Are the flower buds of plants formed, *ordinarily*, the spring or season previous to their development?

Is it not probable, that these trees during their second growth, formed new flower buds to take the place of those untimely developed?

Are there latent flower as well as leaf buds which may develop blossoms in cases of emergency?—F. L. HARVEY. ARK. IND. UNIV., *Fayetteville, Ark.*

Botanical Gazette.

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Editorial.—MR. J. G. LEMMON has published a small pamphlet entitled "Ferns of the Pacific Coast, including Arizona." A full conspectus of the tribes and genera is given, and also a classified list of the species, giving the principal points of distinction and places of growth. The announcement is also made that Mrs. Lemmon is about to publish a "Manual of Pacific Ferns." The price of the pamphlet is 35 cts., or $3.50 per dozen.

MR. J. SAUNDERS has given in *Hardwicke's Science-Gossip* the results of his study of Gray's Manual of Botany with reference to the colors of fruits of the northern United States. He includes both colored fruits and seeds, and finds that there is a great preponderance of red and black, the former being about 45 per cent., the latter about 33 per cent., while yellow, blue and white occur only in very limited numbers.

S. E. CASSINO is just about to publish a work on North American Lichens by our highest authority, Prof. Edward Tuckerman. It will appear in volumes and be sold at a very low figure. As a very small edition is to be printed and the work is not to be stereotyped orders should be sent in early. The price for Vol. I has been fixed at $3.50, though orders received before March 1st will be filled at 10 per cent. discount. The first volume will be 8vo. and will contain nearly 300 pages, comprising the *Parmeliacei, Cladoniei* and *Cœnogoniei*.

JAMAICA MUST BE a paradise for the fern collector, over 450 species being enumerated as belonging to its flora.

DR. ENGELMANN, in the January *Torrey Bulletin*, notes the occurence of *Sagittaria natans*, Mx., in the Charles River, Mass., observed by Mr. C. E. Faxon, also observed in the Noponset and Ipswich Rivers by Mr John Robinson It never perfects fruit and hence seems not to be at home in these northern waters. In Gray's Manual these northern forms were included in *S. graminea*. *S. pusilla*, Pursh, must now be considered but a subterrestrial form of *S. natans*

MR. DARWIN's methods of work are peculiarly his own and their results have made astonishing additions to scientific knowledge, but because Mr. Darwin's methods have yielded such results to him it is no indication that any one using the same methods will become a successful investigator. It needs the man as well as the methods,and

there are investigators in this country who have adopted the latter without any thought of the need of the former, and their observations are "as utterly barren of important results as an undigested weather record." The pages of our scientific periodicals are sometimes burdened with such material.

EDITOR GAZETTE:—Your note about oaks on page 2 of the January number puts a greater responsibility on me than I am capable to bear. I have seen of Buckley's Oaks only miserable and incomplete dried specimens and could therefore only make guesses and suggestions on them and not "decisions." How important and necessary it is for a "closet-botanist" to occasionally refresh his botanical vision by communing with living nature I have seen on my extended visits to the Pacific States and the Rocky Mountains. My observations there have furnished new views and suggested different corrections of former statements; a few of them you printed in the last number. others will follow. But I must confess that I am not any farther advanced in the knowledge of those Texas Oaks, never having had the opportunity to study them in numerous and complete herbarium specimens nor having seen them growing. Buckley's *Quercus Texana* is undoubtedly correctly placed by him with the polymorphous *Q. rubra*. —G. ENGELMANN.

NO DEPARTMENT OF BOTANY seems to the average botanist so unsatisfactory and perplexing as that of Fossil Botany. We all know how difficult it is to name plants when the specimens are only tolerably complete, but to name them from the merest fragments of stems and leaves is something that must border very closely upon guess work. Such naming too becomes of very great importance when the age of formations rests upon the evidence of fossil plants. It would sometimes seem as if the botanist started in with the idea that the fragments must of necessity belong to genera and species unlike any living in the same region. Still some splendid work has been done and our countryman, Mr. Lesquereux, has had by no means the least share in it. As an instance of the uncertainty of such work at the best. Mr J. Starkie Gardner, in a late copy of *Nature*. speaks of Dr Heer's work upon the fossil flora of Madeira. The terminal leaflets of a *Rubus* were referred to *Corylus*, and the various leaflets of another species of *Rubus* were referred to *Corylus*, *Ulmus* and *Psoralea*, and so on in several other instances.

OF THE MULTIPLICATION OF SPECIES there is no end. The collector's first ambition is to find new species and when that is gratified and many new species bear the discoverer's name, the next ambition is to name the new species himself. It is not very hard, nor does it take many appliances to name and describe a species as new, but it is very hard and it takes the greatest command of appliances to discover the fact of its being really new. One generation coins specific names, a large percentage of which appear in the synonymy of the next generation. Any one looking over the species of Torrey and Gray's Flora of a generation ago and then hunting in Watson's Index to see what has

become of them will appreciate this fact. But still species are describ-ed by botanists with a limited collection of plants, a still more limited library and sometimes even with no proper conception of what constitutes a species. Any one may get the credit of describing a new species authoritatively by referring it to competent authorities, upon whom after all will fall the burden of the work in deciding its genuineness. Many forms are now enjoying the pleasure of a name "for a season," and many a species in this and other countries is bearing two or more names, and only waiting for the question of priority to be settled.

MR. F. KITTON in *Science-Gossip* describes the method of staining vegetable tissues practised as early as 1774. We give it for the benefit of some of our friends who are laboring over the preparation of beautiful slides, as containing some hint that may be of service. "Dissolve one drachm of sugar of lead in one ounce and a half of water; filter the material. A stem, or piece of a small branch of a tree is to be immersed upright for half its length in this solution, and covered with a glass to prevent evaporation, and allowed to remain two days in it. Cut off the part immersed and throw away. Place the remaining piece in orpiment lixivium (which is thus prepared). Place in a basin two ounces of quicklime and an ounce of orpiment; pour upon them one pint and a half of boiling water. When it has stood a day and a half, it is fit for use. By this process a deep brown stain is produced." This is taken from a work on "The Construction of Timber from its Early Growth, explained by the microscope and proved from experiments in a great variety of kinds By John Hill, 1774."

THERE ARE, and may be always will be, two classes of workers with the microscope. The one class have the microscope itself for an end, and to these the euphonious name microscopist is usually applied. As they have in view continually the perfection of the instrument and all its appliances they naturally run to large and complicated stands with an endless array of accessories. There are the best of reasons for everything they use and they obtain the best of results. The other class consider the microscope simply as a means and have made the science of biology what it is to day. But it is a strange fact that these workers always (we speak now strictly of botanical workers) use the simpler instruments and fewer appliances. The great laboratories of to-day, those which are furnishing the material for books and are filling our scientific periodicals with the results of their work, are equipped with very simple instruments. Does it follow that if such work can be done by ordinary instruments even more astonishing results can be obtain by using finer ones? Or is it a fact that the extra appliances, etc., are more things of "fuss and feathers" than fruitful additions to biological laboratories? A discussion is now going on in the *Am. Monthly Micr. Journal* concerning the relative value of large and small microscopes, the reading of which suggests to the working biologist some such thoughts as the above.

Siberian Vegetation.—Baron Nordenskjold in his "Voyage of the Vega," gives a sketch of a journey up the Yennissi River, in which occurs the following account of the vegetation: "As is the case with all the other Siberian rivers running from south to north, the western strand of the Yenisej, wherever it is formed of loose, earthy layers, is also quite low and often marshy, while on the other hand the eastern strand consists of a steep bank, ten or twenty metres high, which north of the limit of trees is distributed in a very remarkable way into pyramidal pointed mounds. Numerous shells of crustacea found here, belonging to species which still live in the Polar Sea, show that at least the upper earthy layer of the *tundra* was deposited in a sea resembling that which now washes the north coast of Siberia."

"On the slopes of the steep *tundra* bank and in several of the *tundra* valleys there is an exceedingly rich vegetation, which already, only 100 kilometres south of Yefremo-Kamen, form actual thickets of flowering plants, while the *tundra* itself is overgrown with an exceedingly scanty carpet, consisting more of mosses than of grasses. Salices of little height go as far north as Port Dickson (73° 30′ N. L.); the dwarf birch (*Betula nana*, L.) is met with, though only as a bush creeping along the ground. at Cape Schaitanskoj (72° 8′ N. L.); and here in 1875, on the ice-mixed soil of the *tundra*, we gather ripe cloudberries. Very luxuriant alders (*Alnaster fruticosus*, Ledeb) occur already at Mesenkin (71° 28′ N. L.), and the Briochov Islands (70° to 71° N. L.) are in several places covered with rich and luxuriant thickets of bushes. But the limit of trees proper is considered to begin first at the great bend which the river makes in 69° 40′ N. L, a little north of Dudino. Here the hills are covered with a sort of wood consisting of half-withered, grey, moss-grown larches (*Larix Sibirica*), which seldom reach a height of more than seven to ten metres, and which much less deserve the name of trees than the luxuriant alder bushes which grow nearly 2° farther north. But some few miles south of this place, and still far north of the Arctic Circle, the pine forest becomes tall. Here begins a veritable forest; the greatest the world has to show, extending with little interruption from the Ural to the neighborhood of the Sea of Ochotsk, and from the fifty-eighth or fifty-ninth degree of latitude to far north of the Arctic Circle, that is to say, about one thousand kilometres from north to south, and perhaps four times as much from east to west. It is a primeval forest of enormous extent, nearly untouched by the axe of the cultivator, but at many places devastated by extensive forest fires."

"On the high eastern bank of the Yenisej the forest begins immediately at the river bank. It consists principally of pines; the Cembra pine [*P. Cembra* L.], valued for its seeds; enormous larches; the nearly awl-formed Siberian pine [*P. Sibirica*, Ledeb.]; the fir [*P. obovata*, Turcz.]; and scattered trees of the common pine [*P. sylvestris*, L.]. Most of these already north of the Arctic Circle reach a colossal size. but in such a case are often here, far from all forestry, grey and half-dried up with age. Between the trees the ground is so covered with fallen branches and stems, only some of which are fresh,

the others converted into a mass of wood-mould held together only by the bark, that there one willingly avoids going forward on an unbroken path. If that must be done, the progress made is small, and there is constant danger of breaking one's bones in the labyrinth of stems. Nearly everywhere the fallen stems are covered, often concealed, by an exceedingly luxuriant bed of mosses, while on the other hand tree-lichens, probably in consequence of the dry inland climate of Siberia. occur sparingly. The pines, therefore, want the shaggy covering common in Sweden, and the bark of the birches which are seen here and there among the pines is distinguished by an uncommon blinding whiteness."—*Nature.*

Some Notes on Yucca.—YUCCA ELATA: Trunk 3 to 5 feet or more high, leaves linear rigid sharp-pointed, filamentose on the white margins; with white oval acute or acuminate bracts as long as the pedicels; flowers white, segments ovate acute, ovary attenuated into a whitish style; capsule cylindrical-ovate obtuse short-cuspidate; seeds large, ½ inch wide narrowly wing-margined.—*Y. angustifolia*, var. *elata*. Engelm. Notes on Yucca p. 50. *Y. constricta*, Baker, Yuccoideæ p. 229; not Buckley.

Deserts of Arizona probably extending into southern New Mexico and Mexico. Altogether one of the most stately Yuccas, distinguished from the closely allied *Y. angustifolia*, with which I had formerly united it by its distinct trunk, which is usually 3 to 5 feet, but which I have seen even 10 or 11 feet high, and 3 to 7 inches thick, and especially by its long flowering scape, 3 to 7 feet, naked below, and bearing a much branched panicle often 5 feet long; flowers spreading, 3½ to 4 inches wide, while those of the allied species are more globose, mostly of greenish color, with broadly oval concave segments, with a green stigma; capsule similar to that of *angustifolia*, seeds of same size as in that species but with a narrower margin. Young specimens flower before they make a trunk and they look much like *Y. angustifolia* but can always be distinguished by the naked scape and by the characters of the flower.

Yucca constricta, Buckley, appears to be a form of *Y. angustifolia* with a short trunk; the constricted capsules ascribed to it are not normal but occasionally occur in all species of Yucca.

YUCCA MACROCARPA, Engelm. 6.224 of this journal. has now been found by C. G. Pringle in flower; the panicle is densely pubescent; flowers about 2½ to 3½ inches wide with broadly oval acutish segments. *Y. baccata* has a glabrous panicle and larger flowers with narrow tapering segments. *Y. Schottii*, Engelm., Yucc. 46, from Arizona, is known only from Schott's notes and very poor specimens and has never been identified since. Its panicle is likewise pubescent; its leaves short, narrow and very thick, with few thin fibres. It may possibly be a small-leaved form of *Y. macrocarpa*, which also shows a few thin fibres on the leaves. Both are recommended to the study of observers.—G. ENGELMANN.

North American Hepaticæ. - Among all the groups of CRYPTOGAMIA the HEPATICÆ seem to receive the least attention from students and are also neglected by general botanical collectors. The group was not recognized by Linnæus as a distinct order yet in Class XXIV in his *Systema Natura* he describes forty-five species distributed among the following genera:—*Jungermannia*, twenty-eight; *Targionia*, one; *Marchantia*, seven; *Blasia*, one; *Riccia*, five; *Anthoceros*, three. Although these Linnæan species to some extent have been redistributed among other genera by later botanists, the genera still remain and include some of our common forms of *Hepaticæ*.

Since the time of Linnæus other genera have been formed by Dumortier, Palisot de Beauvois, Raddi, Micheli, Corda, Nees, Lindenberg, Taylor and Lehmann.

The British *Jungermanniæ* were described by Sir W. J. Hooker in 1816, and those of Germany by T. P. Eckart in 1832.

Corda published the *Genera Hepticarum* from Prague in 1828, and Nees von Esenbeck in connection with Gottsche and Lindenberg published the *Synopsis Hepaticarum* from Hamburg from 1844 to 1847; the latter is as yet the only general work on *Hepaticæ* that has been issued

In our own country there have been only two investigators of prominence. W. S. Sullivant (1803–1873) published the "Musci and Hepaticæ of the Eastern United States," which formed an appendix to one of the earlier issues of Gray's Manual; the copyright bears date of 1856 and this work which is the only one attempting to classify our native species is now out of print and can scarcely be obtained at any price.

In the death of Coe F. Austin, of Closter, N. J., in 1880, America lost not only an enthusiastic botanist but her solitary worker among the Liverworts. His contributions to the subject were unfortunately not arranged in any systematic publication, but are found scattered through various scientific journals, notably the Proceedings of the Philadelphia Academy, BOTANICAL GAZETTE, and the Bulletin of the Torrey Botanical Club. In addition to many notes on species already described, Mr. Austin has described over sixty new American *Hepaticæ* besides many from foreign localities chiefly Japan and the Sandwich Islands. His "*Hepaticæ Boreali-Americanæ exsiccatæ*" containing over one hundred and seventy numbers was first distributed in 1874.

Only a small portion of America has been searched thoroughly for Liverworts. Ohio, New Jersey, Florida and portions of New England, California, and Illinois have been more or less carefully examined but the greater portion of the continent is still new territory. Seventy-six species have been catalogued from New Jersey and forty-five from Illinois, yet in the latter State only a few counties have been carefully examined. The descriptions of the American species being so widely scattered through German and English works and inaccessible works and periodicals published in our own country, and especially being written largely in Latin are not in a form to be of especial

value to the *general* student. In the absence of any American specialist in this group, the subject can receive little aid from general collectors or local botanists until the present knowledge of the subject is systematically arranged for reference and study. To this end the present writer hopes to be able to contribute a compilation of the *Hepaticæ* in a form available for study and further investigation and would be pleased to receive any communications respecting distribution, etc.—LUCIEN M. UNDERWOOD, *Bloomington, Ill.*

The following preliminary list is presented for suggestions and corrections:—

LIST OF NORTH-AMERICAN HEPATICÆ—doubtful species are printed in italics.—

ALICULARIA,
  Lescurii, Aust.
ANEURA, Dumort.
  latifrons,
  multifida, (L.), Dumort. var major.
  palmata, (Hedw.), Nees.
  pinguis, (L.), Dumort.
  pinnatifida, Nees.
  sessilis, Spreng.
ANTHOCEROS, L.
  cæspiticius, DeNot.
  Donnellii, Aust.
  fusiformis, Aust.
  Hallii, Aust.
  Joorii, Aust.
  lævis, L.
  Lescurii, Aust.
  melanosporus, Sulliv.; *Notothylas melanospora*, Sulliv.
  Mohrii, Aust.
  Olneyi, Aust.
  orbicularis, Sulliv.; *Notothylas orbicularis*, Sulliv.
  Oreganus, Aust.
  punctatus, L.
  Ravenelii, Aust.
  stomatifer, Aust.
  sulcatus, Aust.
ASTERELLA, Beauv.
  hemisphærica, (L.), Beauv.; *Reboulia hemisphærica*, Raddi.
BLASIA, Mich.
  pusilla, L.
BLEPHAROSTOMA, Dumort.
  trichophyllum, (L.), Dumort.
BLEPHAROZIA, Dumort.
  ciliaris, (L.), Dumort.
CÆSIUS,
  concinnatus, (Lightfoot), B. Gray; *Gymnomitrium concinnatum*, Corda.
CALYPOGEIA, Raddi.
  Sullivanti, Aust.
  Trichomanis, (Dicks), Corda.
    var. rivularis, Aust.
    var. tenuis, Aust.
CEPHALOZIA. Dumort.
  albescens, Hook.
  bicuspidata, (L.), Dumort.
    var. conferta, Aust.
  catenulata, (Huben.), Aust.
  connivens, (Dicks.), Aust.
  curvifolia, (Dicks.), Aust.
  divaricata, (Engl. Bot.), Aust.
    var. confervoides, Aust.
  Macouni, Aust.
  nematodes, Gott.
  Sullivanti, Aust.
CHILOSCYPHUS, Corda.
  ascendens, Hook. and Wils.
  Drummondii, Tayl.
  pallescens, (Dumort.), Nees.
  polyanthos, (L.), Corda.
    var. rivularis, Aust.
CONOCEPHALUS Hill.
  conicus, (L.), Dumort.; *Fegatella conica*, Corda.
DUMORTIERA, Nees.
  hirsuta, (Swz.), Nees.
DUVALIA Nees.
  rupestris, (Bisch.), Nees.
FIMBRIARIA, Nees.
  Bolanderi, Aust.
  Californica, Hampe.
  elegans, Spreng.
  fragans, (Scleich.), Nees.
  tenella, Nees.
  violacea, Aust.
FOSSOMBRONIA, Raddi.
  angulosa, Raddi.
  cristula, Aust.
  longiseta, Aust.
  pusilla, (L.), Nees.
FRULLANIA, Raddi.
  æolotis, Nees.
  Bolanderi, Aust.
  brunnea, Spreng.
  Donnellii, Aust.
  Eboracensis, Gott.

Grayana, Mont.
Hallii, Aust.
Hutchinsiæ, (Hook.), Nees.
Kunzei, Lehm. and Lindb.
Leana, Aust.
Nisqualensis, Sulliv.
Oakesiana, Aust.
plana, Sulliv.
saxicola, Aust.
squarrosa, Nees.
Sullivantii, Aust.
Tamarisci, Nees.
Virginica, Gott.
GEOCALYX, Nees.
graveolens, (Schrad), Nees.
GRIMALDIA, Raddi.
barbifrons, Bisch.
sessilis, Sulliv.
JUNGERMANIA, L.
alpestris, Schleich.
Bantriensis, Hook., var. Mulleri, Lindb.
barbata, Schreb.
var. attentata, Mart.
bicuspidata, L.
biformis, Aust.
cordifolia, Hook.
crenulata, Smith.
var. gracillima, Hook.
crenuliformis, Aust.
excisa, Dicks.
var. crispata, Hook.
fossombronioides, Aust.
Gilmani, Aust.
Helleriana, Nees.
Hornschiana, Nees.
hyalina, Lyell.
incisa, Dicks.
inflata, Huds.
var. fluitans,
Michauxi, Weber.
minuta, Crantz.
pleniceps, Aust.
polita, Nees.
porphysoleuca, Nees.
pumila, Witte.
Schraderi, Mart.
setiformis, Ehrh.
sphærocarpa, Hook.
Sullivantiæ, Aust.
ventricosa, Dicks.
Wallrothiana, Nees.
Wattiana, Aust.
LEJEUNIA, Libert.
auriculata, Hook. and Wils.
calyculata, Tayl.
cavifolia, (Ehrh.), Lindb.
clypeata, Schwein.
cucullata, Nees.
cyclostipa, Tayl.
echinata, (Hook.), Tayl. M. S.
fooriana, Aust.
longiflora, Tayl.
minutissima, Dumort.
Mohrii, Aust.
polyphylla, Tayl.
Sullivantiæ, Aust.
testudinea, Tayl.
LEPIDOZIA, Nees.
reptans, (L.), Nees.
setacea, (Web.), Mitt.
LEPTOSCYPHUS.
Taylori, (Hook.), Mitt.
LIOCHLÆNA,
lanceolata, (L.), Nees.
LOPHOCOLEA, Nees.
bidentata, (L.), Nees.
crocata, (DeNot.), Nees.
Hallii, Aust.
heterophylla, (L.), Nees.
Macouni, Aust.
minor, Nees.
MADOTHECA, Dumort.
Bolanderi, Aust.
involuta, Hampe.
navicularis, (Lehm. and Lindb.), Nees.
platyphylla, (L.), Dumort.
porella, (Dicks.), Nees.
rivularis, Nees.
Sullivanti, Aust.
thuja, Dicks.
Watangensis, Sulliv.
MARCHANTIA, L.
disjuncta, Sulliv.
polymorpha, L.
MASTIGOBRYUM, Nees.
deflexum, (Mart.), Nees.
trilobatum, (L.), Nees.
var. *tridenticulatum*.
MASTIGOPHORA.
Californica, Aust.
METZGERIA, Raddi.
furcata, (L.), Nees.
pubescens, Raddi.
ODONTOCHISMA, Dumort.
Hubeneriana, Rab.
scutata, (Web.), Aust.
Sphagni, (Dicks.), Dumort.
PELLIA, Raddi.
calycina, (L.), Nees.
epiphylla, (L.), Nees.
porphyrorrhiza, (Nees.), Aust.
PHRAGMICOMA, Dumort.
clypeata, (Schwein), Sulliv.
xanthocarpa, L. and Lg.
PLAGIOCHASMA, Lehm. and Lindb.
erythrosperma, Sulliv.
Wrightii, Sulliv.
PLAGIOCHILA, Nees and Mont.

asplenoides, (L.), Nees and Mont.
interrupta, Nees.
Ludoviciana, Sulliv.
porelloides, Lindb.
spinulosa, (Dicks.), Nees and Mont.
undata, Sulliv.
PLEURANTHE, Tayl.
olivacea, Tayl.
PRESSIA, Nees.
commutata, (Lindb.), Nees.
RADULA, Nees.
Caloosiensis, Aust.
complanata, (L.), Dumort.
Hallii, Aust.
obconica, Sulliv.
pallens, (Swz.), Nees.
spicata, Aust.
Sullivanti, Aust.
Xalapensis, Mont.
RICCIA, Mich.
albida, Sulliv.
arvensis, Aust.
var. hirta, Aust.
Beyrichiana, Hampe.
bifurca, Hoffm.
Californica, Aust.
crystallina, L.
Donnellii, Aust.
fluitans, L.
var. terrestris.
var. lata.
var. canaliculatus, Hoffm.
Frostii, Aust.
glauca, L.
lamellosa, Raddi.
Lescuriana, Aust.
lutescens, Schwein.
natans, L.
var. terrestris, Aust.
nigrella, DeCand.
sorocarpa, Bisch.
Sullivanti, Aust.
tenuis, Aust.
tumida, Lindb.
Watsoni, Aust.
SARCOSCYPHUS, Corda.
adustus, Nees.
Bolanderi, Aust.
emarginatus, (Ehrh.).
var. aquaticus, G. L. N.
sphacelatus, (Gies.), Nees.
SAUTERIA,
limbata, Aust.
SCAPANIA, Lindb.
albicans, (L.), Mitt. var. taxifolia.
Bolanderi, Aust.
breviflora, Tayl.
compacta, (Roth.), var. irrigua.
exsecta, (Schmidt).
nemorosa, (L.), Nees.
Oakesii, Aust.
Peckii, Aust.
subalpina, (Nees.).
uliginosa.
umbrosa, (Schrad.) Nees.
undulata, (L.) Nees and Mont.
SENDTNERA, Endl.
juniperina, Nees.
SPHÆROCARPUS, Mich.
Berteri, Mont.
Californicus, Aust.
Donnellii, Aust.
Michelii, Bellardi.
Texanus, Aust.
SPHAGNŒCETIS, Nees.
Macouni, Aust.
STEETZIA, Lehm.
Lyelli, (Hook.) Lehm.
TARGONIA,
Michelii, Corda.
THALLOCARPUS, Lindb.
Curtissi, Aust.
TRICHOCOLEA, Nees.
Tomentella, Nees.

Genera, 49; species, 219; varieties, 17.

The Mistletoe.—The Mistletoe of the Eastern States has a general resemblance to that of Europe, *Viscum album;* but the old genus *Viscum* has been divided by modern botanists, although the lines of distinction are somewhat artificial. We have two genera, *Phoradendron* and *Arceuthobium*. Among the leading distinctions may be mentioned that the European branch of the family, *Viscum*, as now restricted, has the anther open by three pores or slits, our *Phoradendron* by two, while the *Arceuthobium* has but one. There are other slight differences in pollen grains, cotyledons, and form of the fruits. The European Mistletoe is usally found on deciduous trees only, an instance being recorded where it has been found on the Scotch pine in Germany, and its American representative. *Phoradendron*

flavescens, Nuttall, seems also confined to deciduous trees and shrubs. This extends across the continent, a form being found on the Pacific coast still confined to deciduous plants; while another genus, *Arceuthobium*, seems wholly confined to the coniferous trees which are mixed with the deciduous ones. The name *Arceuthobium* is suggestive of this fact, it being derived from two Greek words signifying "living on the juniper." *Phoradendron*, on the other hand, means simply "living on, or stealing from trees." *Arceuthobium*, however, does not live wholly on junipers. In the herbarium of the Phila. Academy is a specimen of *A. occidentale*, growing on *Juniperus occidentalis*—some Nevada specimens are on *Pinus ponderosi*. I have specimens of *Phoradendron juniperinum* from Nevada growing on *Libocedrus decurrens*, which, by the way, is, I believe, the first time this pretty cupressineous tree has been reported from the State of Nevada. Among the differences noted by Engelmann in the Botany of California, between *Phoradendron* and *Arceuthobium*, is that while the former flowers in February and March, and matures its fruit "next winter," the fruit of the Californian species opens in the summer, and does not mature till the "second autumn." The European Mistletoe is stated by Bentham to open in spring, and perhaps this is so; it was formerly supposed to be the case with the American *Phoradendron flavescens*, but Mr. Wm. Canby had shown to the Phila. Academy recently, that in Delaware the flowers open in the fall, and the fruit matures in the autumn of the following year, or just one year afterward. The flowers and fruit are on the trees at the same time together. If this is general with *Phoradendron*, it still lessens the distinctions between the genera. Usually *Phoradendron* bears leaves, while *Arceuthobium* is leafless—but the *Libocedrus* parasite is as destitute of leaves as an *Arceuthobium*, and the common observer would see little in their general aspects to distinguish them. But there is one great difference in the genus, at least as represented by these two species. In opening the box which contained the specimens, the whole mass was covered with a dense viscid secretion, which rendered it very difficult to separate one branch from another. On leaving the lid open a little while, the watery particles soon evaporated, leaving a dry gummy deposit over the whole surface. While this was going on, the seeds were ejected with great force from their endocarps, being projected against the face with such force as to leave a stinging sensation. Dr. Engelmann has noted this power of ejection in the berries of this plant. The *Phoradendron* exhibits no trace of any such power, though there seems to be little difference in the structure of the berries. These facts raise a nice teleological question. Birds do not seem to use the berries. As they are so viscid that the famous bird-lime is made from some species, it is probable the very viscidity would prevent the free use of the beak in any attempt to use the seeds. But it is believed that by becoming attached to the feet or feathers of birds, the seeds are widely distributed, and that in this way the plant has all the advantage necessary for distribution in the "struggle for life." But *Arceuthobium*, besides all the advantages

to be derived from this mode of distribution, has an additional aid from a projecting force.

Did *Arceuthobium* at one time exist when or where there were no birds, and had it to depend on this projection alone for its distributing power, and is the viscidity a later development? Did *Phoradendron* once possess the power, and has it abandoned it from having through the ages found out that it travels well enough without its exercise? Or is it rather, as I am inclined to believe, that nature loves to aim expressly at variety. and is continually exhibiting her power to accomplish the same end by a wonderful variety of means? But whatever may be thought of the various theories of development, and the laws of final causes which may have operated to produce changes, there can be but little doubt but parasitism is an acquired habit, and the endeavor to find out what these plants were, and how they behaved before they were parasites, is fast becoming one of the most interesting of biological studies.

The seeds ejected from the endocarp in *Arceuthobium* fasten themselves to the branches of trees by a glutinous mass at one end. This end is opposite to the radicle, which, in germinating, has to push out from above, and curve downward towards the branch in order to attach itself. I have not seen them during the process of germination, but as the testaceous covering is held fast by the glutinous secretion. it is probable the cotyledons are drawn out as the plumule takes its upright position, leaving the testa as an empty case fastened to the branch. Presuming that this must be the case with other Loranthaceous plants, it is difficult to understand the process by which the East Indian species performs the locomotive feat recently noted by Dr. Watt, and which from its remarkable nature has had a wide publication. It was reported as the observation of Dr. Watt that a seed falling on and becoming attached to the coriaceous leaf of a *Memecylon*, would send out its radicle, which, curving down. formed a flattened disk by which it attached itself to the leaf. But, as if it knew that a leaf could not permanently support a perennial plant, the cotyledons were lifted and turned to the other side, when the end with the disk moved to another place, and in this way the seed traveled to a more favorable spot. Without reflecting on the observation, I believe it should be repeated in order to be sure of no mistake In all plants in our country which fasten to an object through a disk at the end of a rootlet or tendril, as in *Ampelopsis* and *Bignonia capreolata*, the attachment is made while the disk is forming. A disk once formed, does not reattach itself to an object when removed from the original spot. In like manner the cotyledons, once removed from the endo carps, would have no viscidity with which to form a resisting power while the disk was unfastening itself from its undesirable location. There is, however, so much of singular behavior in the Mistletoe family that further observations are very desirable.—THOS. MEEHAN, *Proc. Phil. Acad.*

Pastinaca sativa Proterandrous.—Umbelliferæ are mostly proterogynous, and so it was a matter of surprise to me to find an exception in our common Parsnip. The anthers discharge their pollen very early and fall off while the rudimentary styles can be seen as mere protuberances on the disk crowning the ovary. In time, the styles lengthen, separate, the stigmas develop, and the flower is now capable of being fertilized. This is accomplished by means of numerous small coleoptera and other insects which frequent the plant. As the plant is fertile with its own pollen, this arrangement must exist to prevent excessive close breeding.—AUG. F. FOERSTE, *Dayton, O.*

Malvastrum angustum in Ottawa, Ill.—I have found *Malvastrum angustum* in Ottawa on Trenton limestone. The only locality given in Gray's Manual is Rock Island, and Patterson says, in his catalogue of Illinois plants, that that locality is now covered by the government buildings. It was almost past blossoming when discovered, but I have several fruited specimens for exchange. It grows quite near, and in the same formation with the *Petalostemon foliosus*. *Croton capitatus* is also abundant near by, and *Calamintha glabella*, var. *Nuttallii*.—H. L. BOLTWOOD.

Notes From Dayton, Ohio.—In a *Dicksonia punctilobula*. Kunze, collected by Mr. A. P. Morgan, I noticed several pinnæ forking a little above their bases. This variation, although not rare in other genera, I have never seen mentioned in a *Dicksonia*.

I have also found *Lycoperdon pedicellatum*, Peck, a species hitherto found only in New York. I am indebted to its author for the determination.—AUG. F. FOERSTE.

List of the Genus Carex.—With this number we publish as an extra the first part of a list of the species of *Carex* as found in Gray's Manual, with the synonymy. Mr. J. F. James, Curator of the Cincinnati Society of Natural History, was led to the preparation of this list by his own needs; and thinking that the needs of many other botanists may be similar, we present it to our subscribers as a help to their study of this troublesome genus. The list will probably be completed with the next number.

Notes From Independence, Mo.—During the past season I have found here *Conobea multifida*, Benth. with ternate leaves, though rarely the upper are in twos.

A white flowered form of *Verbena stricta*, Vent., with a white flowered *Delphinium exaltatum* Ait., both abundant.

Specularia leptocarpa, Gray, very plenty on damp rocks. *Verbena Aubletia* L., and *bracteosa* Michx., in dry and open prairies, both very common

Salvia azurea, Lam., with the variety *grandiflora*, Benth., which seems very distinct.

Solanum rostratum, Dunal, is a pest on our streets and seems like a native. Can furnish a number of the above on exchange.—FRANK BUSH

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Note on Salix Sitchensis and its affinities.—Among some specimens of willows sent from Washington Territory, by Mr. W. N. Suksdorf, my attention was particularly directed to one showing but a single stamen under each scale. There were fertile aments. to match, and good leaves accompanying both sexes, so that I had no hesitancy in referring all to *Sailx Sitchensis*, the fruit of which is quite unique among American willows. Need I say that no time was lost in a critical re-examination of all the staminate *Sitchensis* in my herbarium, from British Columbia to California, nor how astonished I was to find this peculiarity of a single stamen, constant throughout! At first glance the profusion of stamens in Mr. Howell's specimens appeared to belie any such reduction, but it needed only the most cursory examination with a magnifier to show what an oversight I had been guilty of, at the very outset, in framing my key to the *Diandræ* of the Californian Flora. This brings me directly to remark that we have now a clew to the true character and affinity of that obscure species, *S. Coulteri*. It is, in my opinion, simply an extravagant, autumnal growth of *Sitchensis*, bearing the same relation to the normal development of the species that the serotinous state of the *S. lasiolepis* (upon which *S. Hartwegi* was founded) does to typical *lasiolepis*. Considering the excessive variability of the leaves of willows there is nothing in the form, vesture, petioles or stipules to invalidate this view, while on the other hand we have the significant fact that *Sitchensis* and *Coulteri* share together the single stamen—a character unique among Pacific coast willows.

Salix Coulteri is known only from two gatherings, the original one by Coulter, and the other by Bolander, both staminate, with scarcely developed aments appearing in the axils of leaves so old, so thoroughly mature and rigid, that where doubled in pressing they have *broken* instead of bending. Above there is a younger growth, such as might appear along with the normal expansion of the aments. Bolander says the tree is "common in Marion county," but if this is true why has the pistillate plant never been collected? If however we find that *Coulteri* is only an abnormal, secondary growth of what under ordinary conditions would be recognized as *Sitchensis*, the answer is obvious. Old leaves of *Sitchensis*, known to be such, I have never seen. I doubt if they exist in any herba-

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rium on either side of the Atlantic. At best we have had young, succulent growths—usually taken with the mature fruit. Mr. Suksdorf's specimens give us the full grown—if not the old and rigid leaves, and they show a decided approach to so called *Coulteri*! It remains to consider the thicker and more densely villous aments, and the stout, furrowed, tomentose twigs of *Coulteri*; but here again Mr. Suksdorf's specimens are intermediate in character, and we need only concede a degree of variation paralleled by our famliar *S. humilis* to warrant the uniting of the two extremes.

I broach, with much hesitancy, a further consideration of the place of *S. Sitchensis* in a methodical arrangement of species. Professor Andersson grouped it with *sericea* and *petiolaris* as a peculiarly American type, at the same time arranging *Coulteri* with *lasiolepis* as manifestly representing the European *S. daphnoides*, suggesting however a doubtful affinity to *S. discolor* (*eriocephala*) and *S. lanata* through the intermediation of *Hookeriana* and *speciosa*. Remembering the scanty material before the distinguished Salicologist these conjectures appear sufficiently plausible; but *Coulteri*, must be most nearly allied to—if not identical with—*Sitchensis* and it is clear that *Sitchensis* is distinguished from the species with which it has been heretofore associated not only by the single stamen but also by the long, narrowly cylindrical fertile aments erect then spreading, subsessile capsules with manifest style—short petioled leaves with entire revolute margins, etc.

May it not be that *Sitchensis* represents in America the European *Synandræ*; a group so commonly distributed throughout Europe and Asia that its entire omission from our flora has always appeared remarkable, and furthermore one which if found at all with us would most likely appear on the Pacific slope where already *S. Breweri* gives us our only species of the *Viminales*. Is the coalescence of the two stamens in *purpurea* carried a step further to the extreme of suppressing entirely one of the members in *Sitchensis*?

A peculiar American type it may still be, "*pulcherrima et distinctissima species*" it most certainly is, but its place seems to be with or near the *Synandræ* rather than among any of the recognized groups of the *Diandræ*.—M. S. Bebb.

Protandry of Pastinaca.—Will you kindly allow me to correct a mistake into which your correspondent, A. F. Foerste, falls, in his note on "Pastinaca sativa Proterandrous" (Bot. Gazette, Feb. 1882, p. 24.). So far as I know all *Umbelliferæ* that have been studied in this respect are described as protandrous, and in nearly every case the dichogamy is quite as marked as in *Pastinaca*. Although not understood, the fact was observed by Pontedera 160 years ago; and it was well described and explained by Sprengel near the end of the last century. There are probably a few genera having inconspicuous flowers, with imperfect protandry, and it is not impossible that synacmic species may be found. So

far as I recollect, however, no case of this sort is known in the order; and the only instance I recall in which the dichogamy is incomplete enough to allow self-fertilization is afforded by the genus *Hydrocotyle*, described by Herman Muller (Weitere Beobachtungen, 1879, I. p. 32-33.). Even here there is very pronounced protandry, for the stigmas do not become receptive until the last stamen has matured; and the accelerated development of the pistil is doubtless correlated with the reduced flowers and umbels of this aberrant genus, and the attendant decrease in the number of its insect visitors. The causes which led to this reduction in the attractiveness of the flowers are probably of an entirely different nature, and connected with the changed habit of the plants. In Germany the flowers of the parsnip are said by Dr. Muller to be visited by Hymenoptera and Diptera, never by Coleoptera!—Wm. Trelease, *Cambridge, Mass.*

Seeds of Orontium and Symplocarpus.—Has any Botanist of U. S. got ripe seeds of *Orontium* and of *Symplocarpus*, and will they forward some by mail to Sir J. D. Hooker, Royal Gardens, Kew, London? No matter how old; they are wanted for the *structure*.—A. G.

The Greenland Flora.—A year hence the classical *Flora Danica* will be terminated by the completion of the seventeenth volume. The work will contain figures of 4,000 species of plants, of Scandinavia, including Greenland and Iceland. It has been published wholly at the expense of the King of Denmark, and a right royal work indeed. At its completion the plates (in folio) which relate to Greenland plants, and which illustrate its whole flora, are to be separately issued, with a brief letter press, under the title of *Icones Floræ Groenlandicæ*. As this flora is in one sense American, and as the copies of the whole Flora Danica in the United States are and must be very few, we take pleasure in announcing this illustrated Greenland Flora to American botanists. Some of them will wish to possess it. The price of uncolored copies is fixed at 56 francs, of the colored at 236 francs. It should be added that, as the impression is strictly limited, application should be made very promptly. The editor, Professor Joh. Lange, Copenhagen, informs us that he will himself receive subscriptions, up to the first of May next.—A. G.

A Note from Emesby.—Editor of the Botanical Gazette.—Let me thank Professor Rothrock most heartily for his courteous statement—or rather re-statement—of the methods and "trend" of botany teaching in the University of Pennsylvania; after which I ought not to have another word to say further than to disclaim all thought or intention of "criticising" the articles which appear-

ed in the GAZETTE from the pen of this genial writer; articles which no one could have read with more cordial appreciation than I. The truth is, I was away from home, and dropping into a public reading room to spend a leisure hour, I picked up a periodical which, for all the botany it contains, I have not considered worth subscribing for, and the whole spirit of the little I did read on this occasion prompted my hasty and inconsiderate protest. Had I waited for the next number of the GAZETTE, giving Prof. Beal's methods and the editorial comments theron I would have felt reassured and remained in becoming obscurity.

I wrote in the interest of the "average amateur"—being of that "small fry" myself. I had no right—indeed am utterly incompetent—to write in the interest of the average Professor seeking to advance the cause of Science and at the same time his individual reputation "in the direction of least resistance" by working in fields that have only been left unexplored because they are comparatively uninviting.

But I must have said something very naughty to stir up the Botanical editor of the *Naturalist* to a notice covering just nine lines, but so crowded with apparently unconscious perversions, misquotations, and unwarranted inferences that I stand amazed! I am charged with placing too high a value on the "identification of a *few plants* (when I distinctly urged the very reverse) or the "finding of a new species"—when I never said a word about new species, and in point of fact consider "new species" a chance game, the "finding" of which may just as well fall to the lot of a fool as a philosopher. The eliminating of Mr. Watson's species to which I incidentally referred, directly resulting from a thorough revision of the genera to which they respectively belong, is quite another matter.

What I did say is this: that a large proportion "of amateurs are interested" in plants themselves, in their structural affinities as expressed in a methodical arrangement "which involves organography—comparative morphology—and systematic botany" and "in their geographical distribution and antecedents." Under this last head may I quote from an address given by Charles Kingsley to the Scientific Society of Winchester. He says: "I ask you to consider for a time, a subject which is growing more and more important and interesting, a subject the study of which will do much toward raising the field naturalist from a mere collector of specimens—as he was twenty years ago—to a philosopher elucidating some of the grandest problems. I mean the infant science which treats of the distribution of plants and animals over the globe and the causes of that distribution." "It begins with asking every plant or animal you meet, large or small, not merely what is your name? That is the collector and classifier's duty, and a most necessary duty it is, and one to be performed with the most conscientious patience and accuracy so that a sound foundation may be built for future specu-

lations. But * * how did you get here? By what road did you come? What was your last place of abode?" And better still, Wallace in "Island Life," p. 6: "If we take the organic productions of * * * any very limited tract of country, such as a moderate country parish, we have, in their relations and affinities—in the fact that they are *there* and others are *not* there, a problem which involves all the migrations of these species and their ancestral forms—all the vicissitudes of climate and all the changes of sea and land which have affected those migrations —the whole series of actions and reactions which have determined the preservation of some forms and the extinction of others—in fact, the whole history of the earth, organic and inorganic, throughout a large portion of time." And further on he says: "We require then in the first place an adequate knowledge of the fauna and flora of the whole world and even a detailed knowledge of many parts of it." * * "This kind of knowledge is of very slow growth and is still very imperfect. In the next place we require a true and natural classification of animals and plants so that we may know their real affinities and it is only now that this is being generally arrived at." Here certainly, is "ample room and verge enough" for the exercise of all the mental power the "average amateur" is possessed of—not to include the average Professor as well.

I distinctly disclaimed any intention to disparage histological studies, but nevertheless would protest against the thrusting of histology upon students as a first step in the acquisition of a knowledge of systematic botany. Need I do more in this connection, now, than to remind the reader of the programme of a summer school, not long since, and place beside it this quotation from the preface to the last edition of Gray's Text Book: "Structural and Morphological Botany of Phaenogamous Plants properly *comes first*. It should thoroughly equip a botanist for the scientific prosecution of Systematic Botany, and furnish needful preparation to *those who proceed* to the study of Vegetable Physiology and Anatomy!"

But I don't "understand plants as living things." That depends! I strive to the extent of my ability to study my fellow-men as "living things;" but I much prefer to go to the Herbert Spencer's Sociology for instruction to dissecting a cadaver under the best demonstrator of human anatomy in the country. It is a question of predilection as I said before—and I for one do not propose to quietly submit to the claims of the anatomists that they are the only students of "living things."

Is the little tufted, alpine *Diapensia* which we find on the summit of Mount Washington, with all the fascinating associations which cluster around it as a relic of the glacial period, more or less a living thing than a pickled pumpkin vine?

As to the advantage of the study of botany on account of the

comprehensiveness and perfection of its classifications let me offer the following from Prof. Youmans: "No other subjects compare with zoology and botany in these respects. Not only do they furnish inexhaustible material for the exercise of memory, but by the presentation of facts in their natural relations, they exercise it in its highest and most perfect form." * * "They open to us the broadest view of the relations and harmonies of organic nature, and are best fitted to discipline the mind in dealing with large co-ordinations, and the comprehensive arrangement of objects of thought, whether in the arts, the professions, business or science."

I have quoted freely the words of eminent men, hoping thereby to encourage young botanists to hold bravely to their preferences, who might have treated any argument advanced by myself as not worthy of consideration.—EMBSBY.

American Grape Mildew in Europe.—The fact that our common grape mildew, *Peronospora viticola* B. & C. grows luxuriantly on cultivated varieties of *Vitis vinifera* in this country was noticed in the Bulletin of the Bussey Institution of March, 1876, and although owing to the dryness and short duration of our summers it was there stated that no great harm need be anticipated to the grape crop in the northeastern States, it was suggested that the case might be very different should the fungus be introduced into the vineyards of Central and Southern Europe, where the climatic conditions are very different from ours. In 1877 Dr. Cornu called attention, in the Comptes Rendus, to the danger of the introduction of the *Peronospora* into France by the importation of American vines; and, as is well known, his fears were soon realized. In 1878 the mildew was detected by Planchon in the southwest of France, and in the following year by Therry in the vicinity of Lyons, by Pirotta in Northern Italy, and in Switzerland. Since then the spread of the disease has been rapid and it has attacked the vineyards in the greater part of France and Italy and has extended as far eastward as Hungary and as far southward as Algiers.

As was natural, great alarm was excited by the appearance of the fungus in wine growing districts, and the agricultural journals of France and Italy especially have contained numerous articles on the disastrous effect of the mildew and the means of prevention. With reference to the injurious effect on the wine crop opinions vary considerably; some maintaining that the *Peronospora* is even more harmful to the vine than the *Phylloxera*, while others declare that the injury done is not great. Official investigations have been undertaken in Italy and France for the purpose of ascertaining the best way of combatting the disease.

The latest contribution on the subject is the Report of Prof. Prillieux in the Journal Officiel, Jan. 9th, 1882, who was appointed to study the mildew and its development in the vineyards of France

and Algiers. After giving an account of the morbid appearances produced in the vines and a sketch of the development of the *Peronospora* and its mode of propagation, he states that the evil effects of the *Peronospora* are much greater in Algiers than in France. In the former country the fungus makes its appearance in May, causes the leaves to wither, and exposes the young grapes to the burning sun. The activity of the disease disappears in July. In the region of Bordeaux the mildew also appears early in the season and sometimes with such virulence that the conidial tufts appear not only on the leaves and young stems but also on the flowers and young berries, on which parts, as far as I know, the fungus has never been observed in this country. Prof. Prillieux, however, does not think that the harm done by the *Peronospora* is very great to the wine crop, for the danger is not so much from injury to the grapes as from injury to the nutrition of the vines by the premature fall of the leaves. Admitting that in exceptionally moist years serious trouble might arise, he thinks that in ordinary years the dry weather of midsummer would prevent marked injury from the growth of the *Peronospora.*

The use of lime having been proposed by Prof. Garovaglio, of Pavia, as a remedy, M. Prillieux experimented with powdered lime sprinkled on the leaves, but he found no beneficial effects. Even when the spots on the leaves where the *Peronospora* appeared were cauterized new conidial tufts appeared on the margin of the spots. Experiments with antiseptic fluids sprinkled on the leaves were without satisfactory results. As a practical measure it is advised to burn the leaves affected, because the oospores contained in them carry the disease over to the next season. Oospores have been found by Millardet and Prillieux in grape leaves in France, and the latter thinks that they occur abundantly. It is not improbable that they are abundant in this country, but owing to the density and hairiness of the leaves of most of the varieties of grape cultivated in this country it is almost impossible to detect their presence with the naked eye or a hand lens, and, as far as my own experience goes, examinations with the compound microscope show oospores only in a comparatively small number of leaves. A continued observation of the disease as it occurs in New England has failed to convince me that any perceptible injury is done to the vines in that region where the short and unusually dry summers are unfavorable to the full development of the *Peronospora*. Dr. Engelmann, however, states that the fungus produces injury in some of the Western States. In Algiers, where the conditions are very different from those of New England and favor the appearance of the fungus early in the season, the disease, as might be expected, is most disastrous.—W. G. FARLOW.

Chrysogonum Virginianum, var. dentatum.—I wish to direct the attention of botanists in the lower Middle and Southern States

to a striking variety of our *Chrysogonum*, which grows apparently intermixed with the ordinary form. The low and subcaulescent forms of the two appear to be nearly alike. But in the well developed and taller forms, rising to a foot in height, the difference is that this var. *dentatum* has the leaves strongly serrate (instead of crenate), all the upper ovate and acute, the base not cordate, the teeth callous-mucronate, and a very pronounced callous mucro makes a conspicuous point to the involucral bracts. It is found on High Island in the Potomac, Maryland, and was first received from Mr. J. Donnell Smith, who collected it in June, 1881. Specimens from the same locality collected in May and June, 1879 and 1880, by Mr. L. F. Ward and Dr. Vasey, communicated by them, exhibit these characteristics in a less degree, and show that we have to do with only a marked variety.—A. GRAY.

Some New Grasses.—POA PULCHELLA.—Culms cespitose, decumbent at the base, from a much branched rhizome, the base crowded with the short almost filiform leaves which are seldom more than 1 inch long, with somewhat broadened and thickened bases; culms slender, smooth, erect, 4 to 6 inches high, with 1 to 2 short leaves, the blade ½ inch long or less, ligule 1 line long, membranaceous, obtuse; panicle 1 to 1½ inches long, 1 inch wide, erect, the lower branches in pairs, spreading, smooth, capillary, each with a single spikelet; spikelets purplish, 3 to 4 lines long, large for the size of the plant, 3 to 5 flowered; lower glumes about 1 line long, 3 nerved, smooth, mostly obtuse or somewhat erosely dentate, broadly scarious margined; flowering glumes about 2 lines long, 3 nerved, lanceolate, the upper ones a little acutish, the lower obtuse with scarious apex, finely scabrous on the keel and nerves, but not pubescent nor webbed at the base; lower palet about equaling the fl. glume strongly bidentate, and scabrous on the conspicuous nerves.

A handsome dwarf *Poa*, related to *P. laxa* but distinct, found by Mr. W. N. Suksdorf, on the Columbia river, from near the river bank to the summit of the hills (2,000 ft.).

POA BOLANDERI.—Culms 1 to 1½ ft. high, erect or somewhat geniculate below, with 3-4 conspicuous rather short and broad leaves (2 to 3 inches by 2 lines); sheaths striate, smooth, loose, ligule membanaceous, obtuse; panicle 4 to 6 inches long, the rays 1½ to 2 in., distant, mostly in pairs, frequently with 2 to 3 additional short ones, at first erect and appressed, becoming horizontal or reflexed, the longer ones 2-3 inches long, slender, mostly flowering near the extremities, the branchlets appressed and short pedicelled; rachis and rays smooth, spikelets 1 to 3 flowered, often only 1 flowered; outer glumes thin, green, scarious margined, the upper about 1 line long, lance-oblong, 3 nerved, frequently lacerate at the apex, the lower about one-third shorter and acuter; flowering glumes 1½ lines long, rather faintly 5 nerved, lanceolate, acute

(sometimes strongly so), smooth or minutely scabrous with a thin webby tuft at the base; palet ¼ shorter than its glume, narrow, smooth.

This is No. 6115 of Bolander's distribution, and recently collected by Prof. M. E. Jones, at Soda Springs, Cal. It is closely related to *Poa arctica*, which was also collected at the same place by Mr. Jones.

STIPA PARISHII.—Culms 1 to 1½ ft. high, leafy especially below; leaves conduplicate or involute, smooth, rigid and divergent, lower ones 6 inches, upper ones about 3 inches long, throat of sheath fringed with a few soft white hairs, ligule very short, upper sheath long, somewhat inflated and enclosing the base of the panicle; panicle about 6 inches long, open and somewhat spreading except at the included base, lower branches in threes, upper in pairs or single, rather few flowered at the ends of the branches and branchlets, longest rays about 2 inches; outer glumes linear-lanceolate, acute, 3 nerved, smooth, the lower one 6 to 7 lines long, the upper 5 to 6 lines, nearly twice as long as the flowering glume, which with the short stipe is 3 to 4 lines long, densely clothed with silky hairs which are longer toward the apex, bidentate, the teeth less than a line long; awn 9 lines long, smooth below, scabrous above.

Collected in the San Bernardino Mts., by Mr. S. B. Parish, for whom it is named.—G. VASEY.

Notes on California Plants.—*Balsamorhiza sagittata*, Nutt. grows on the west side of the Sierras at Summit, along with *Wyethia mollis*.

Dr. Gray did well to take it for granted (without proof) that *Collomia tinctoria*, Kellogg, was a var. of *C. linearis*. I have a form intermediate between the two, showing that they are not distinct as suggested in the Flora of California.

The flowers of *Eriogonum Lobbii* are sometimes ochroleucous, as well as white.

Polygonum Muhlenbergii grows at Santa Cruz.

The leaves of *Spiranthes Romanzoffiana* are net-veined.

Allium platycaule has linear-oblong reticulations. They are not absent.

The heads of *Hieracium albiflorum* are often slightly glandular in my Santa Cruz specimens, and in my Soda Springs specimens they are quite glandular even to the peduncles. The pubescence of the heads, in at least some species of Hieracium and *Crepis*, is a very shaky character.

It is a mistake to say that the leaves of the *Eucalyptus* of California "turn edgewise to the sun" and so give little shade. The young leaves are *pendent* and so vertical of course, but they do not show a sensitiveness by which the petiole is twisted to keep them

edgewise to the sun. The older leaves, however, are not even pendent and hold no particular position to the sun, and the trees give a great deal of shade though not as much as the broader leaved deciduous trees that have also a dense foliage.

Helianthemum scoparium is an almost shrubby perennial.

Arabis platysperma, in robust specimens has *auricled* leaves: the pubescence is more branched than "stellate."

Arenaria Douglasii has concentrically striate seeds, and they are often hairy at the hilum.

Hosackia subpinnata undoubtedly shows a transition to *H. Purshiana*.

I have what I suppose must pass for *Oxytheca dendroidea*, from Nevada. My specimens have all but the lowest bracts in twos; leaves hirsute, linear-oblanceolate; awns 1½ to 3 times the length of the involucre; flowers hirsute; pedicel and involucre glabrous, all the rest of the plant with stalked glands and some stellate hairs.

Menyanthes trifoliata grows in patches acres in extent in the Sierras and at Park City, Utah.

Juniperus occidentalis. I found a peculiar form of this with seed protruding from the berry like an acorn in the cup. Dr. Engelmann informs me that this sometimes occurs. I had never seen it in any *Juniperus* before. The leaves also have a large pellucid spot in the center.

The corolla of *Trifolium barbigerum* is very beautiful under a microscope magnifying about 30 diameters; it is covered with a white or purple net-work with circular meshes. The same is true of *T. cyathiferum* though in a less marked degree.

The seeds of *Hosackia strigosa* appears to the eye to be almost square with a notch on one side. They are, at least in my numerous specimens, a sure index to the species.

Hosackia maritima is often perfectly smooth, leaflets 6-7, stems 2° long, prostrate.

Hosackia Torreyi has the standard beautifully veined with purple.

Trifolium microcephalum has the lobes of the involucre often two-toothed.

My specimens of *Trifolium microdon* are very smooth except the pedicels.

Cornus Californica has very interesting branched hairs. The pubescence of *Platanus racemosa* called "tomentum" in *Bot. Cal.* is made up of very long hairs, branched in whorls or singly and jointed, densely matted, with straight, simple, rather flat hairs on the very young stems. The pubescence is more beautiful than that of *Alternanthera lanuginosa*.

I have *Hosackia oblongifolia* from Santa Cruz, which verifies Mr. Coulter's locality, upon which doubt is thrown in Bot. Cal.

Dr. Engelmann's note on *Eschscholtzia Californica*, in the GAZETTE, reminds me of the broad patches of this plant growing at Santa Cruz on chalky hills. I have seen a mat three feet in diameter growing from one thick root, with plenty of remains of former flowering stems still attached to the plant, showing that it is a perennial as Dr. E. suggests. It is strikingly different from the annual form in Southern Utah, but I doubt its claim to distinctness because of being a perennial.

The base of the petiole of leaves of *Ivesia Kingii* are strikingly hairy, but the hairs are concealed by the decaying remains of the outer leaves. The pubescence is as remarkable as that of *Lygodesmia spinosa*.—MARCUS E. JONES, *Salt Lake City*.

Notes from a Laboratory.—It is not unwelcome to teachers who have little spare time to know just what plant to give to a student of Vegetable Histology with the certainty that the particular tissue under consideration will be found in such form as to render it desirable for examination. With the object, therefore, of recommending a few common green-house plants, in which illustrative examples of the prominent tissues can be found, the following notes, from the work of the Sophomore class of Purdue University, are presented. Most of this work passed under my personal observation.

Of course every one will (if he be not too forgetful) have a good stock of pumpkin or squash stem to illustrate the dicotyledonous stem, and next spring all of us, by Dr. Bessey's recommendation, will lay in a supply of asparagus for the monocotyledonous one. Other plants are frequently wanted however, and the following to be had from almost any green house or window-garden, will be found useful:

Geranium (sp?)* exhibits an abundance of fine compound crystals in a transverse section of the leaf and a few in petiole and stem. Its starch grains are large and abundant (the plant was just well started from a slip) and the layers of cork-cells are numerous and regular.

Ageratum Mexicanum (Blue Ageratum). Collenchyma well shown.

Primula Sinensis (Primrose) has particularly fine trichomes. The presence of chlorophyll bodies in the epidermis is also a marked feature.

Nerium roseum (Oleander) is peculiar on account of the arrangement of the stomata in groups at the bottom of hairy pits in the under surface of the leaf.

*The specific names, when any are given, cannot be vouched for. They are as given me by our florist. All of the plants can be identified either by the common or generic names.

Cuphea platycentra (Cigar or Match Plant) shows splendid glandular trichomes.

Coleus harlequin shows collenchyma nicely.

Tradescantia, sp? (Wandering Jew) has remarkably regular epidermis on the upper surface of the leaves. In horizontal section it appears made up of almost exactly hexagonal cells. Very long slender trichomes at the nodes.

Pilea pilosa (Artillery plant) was one of the most interesting plants examined. The motion of the protoplasm carrying chlorophyll grains can be easily seen in the parenchyma of the primary cortex. Cystoliths, as in its wild congener, *P. pumila* are of extraordinary size and number, thirteen being counted in a cross-section of a small branch. They are everywhere, leaves and stems being full of them! The epidermal cells of the leaves are also extremely large.

Begonia semperflorens will compare favorably with the pumpkin for a "general purpose" plant. The epidermis is composed of large cells; the collenchyma is beautifully regular; the tracheary tissue is represented by spiral, angular, annular, scalariform and pitted vessels, many of the latter exhibiting the "crossed" pits; the lenticils show a peculiar development of cork; the starch grains are large and both simple and compound crystals are present (Vide Bot. Gaz. VII, 12). Finally the stomata occur in groups of 6–14 and show plainly the successive segmentation of the original epidermal cells to form the mother-cell of the stoma.

There is but one objection to the Begonia for general laboratory use and that can be easily overcome. It must be grown especially for the purpose, while any corn-field almost will furnish the standard pumpkin. The ease and rapidity with which it can be grown from cuttings will almost invalidate this objection, and this species seems to be more compact and easily handled than any other. The Begonia has several points of superiority over the *Cucurbitaceæ*, chiefly in the structure of the fibro-vascular bundle, which is much simpler and easier of comprehension by the average student. Trichomes (except on the root) are absent from this species. This plant in connection with those already in wide use, will be found of very considerable value in laboratory work.—Chas. R. Barnes, *LaFayette, Ind.*

A Large Red-bud.—I found growing on the hill-side near my house a specimen of the Red-bud, *Cercis Canadensis*, which was about 14 inches in diameter at a point 10 inches above the ground. The trunk was well-formed throughout and free from from swellings or knots.—O. M. Meyncke, *Brookville, Ind.*

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Editorial.—Mr. E. L. Greene describes six new species of Compositæ in the *Torrey Bulletin* for February. Half of them belong to the genus *Hemizonia*.

New stations are being found for *Asplenium ebenoides*, but not much definite information is gained with reference to the origin of this suspicious species. Whether it is a hybrid between *Camptosorus* and *A. ebeneum* or not still remains to be decided, though the burden of testimony all seems to be in favor of that idea.

Mr. John H. Redfield calls attention to the fact that Dr. Gray, in his Synoptical Flora of N. Am., says that *Plantago elongata*, Pursh, of "Bradbury's collection on the Missouri, is unknown, probably a glabrate form of *P. Patagonica*." Pursh's specimen ticketed (probably from Lambert) *P. elongata*, and noted as from Bradbury, has recently been found in the herbarium of the Philadelphia Academy and proves to be unmistakably *P. pusilla*, Nutt.

Our plant collectors have been unusually active during the past season, and the result is appearing in the unusual number of desirable plants for sale. Handsome catalogues have been received from the Parish Bros., San Bernardino, Calif., Wm. C. Cusick, Union, Oregon, and Prof. Marcus E. Jones, of Salt Lake City. Add to these Mr. Geo. R. Vasey, Mr. C. G. Pringle, Mr. J. G. Lemmon, Mr. W. N. Suksdorf, and Mr. H. H. Rusby, and it looks as though a botanist can obtain almost any western plants he desires.

Prof. J. C. Arthur has issued a fourth "Contribution to the Flora of Iowa." The Flora of this state bids fair to be thoroughly known, for it contains as fine a corps of active collectors as any state can boast. In the present paper the plants to be credited to the state, and not found in Gray's Manual, are *Artemisia serrata*, Nutt., *Senecio lugens*, var. *Hookeri*, Eaton, *Plantago Rugelii*, Decaisne, *Gerardia tenuifolia*, var. *macrophylla*, Benth., *Cuscuta Gronovii*, var. *latiflora*, Engelm., *Polygonum Muhlenbergii*, Watson, *Aristida pupurea*, Nutt.

Thomas P. James.—It is with great regret that the Gazette is called upon to record the death of this eminent botanist. He died in Cambridge, Mass., February 22, in his 79th year. Most of his

life was spent in Philadelphia in mercantile pursuits. From his youth he devoted his leisure to the study of *Cryptogamia* and at the time of his death was recognized by the best authorities as one of the two leaders in the scientific world in the knowledge of mosses and lichens. Retiring from business in 1869 and desiring to devote himself to scientific pursuits, he removed to Cambridge. In Philadelphia he was an officer of the Pennsylvania Horticultural Society. He had been treasurer of the American Pomological Society since its origin until a year since, when he resigned that position. He was for a considerable time the chairman of the committee of publication of the American Philosophical Society, and was connected with other important societies. At the time of his death he was engaged in the preparation of a Manual of North American Mosses, in connection with Mr. Leo Lesquereux, to which he was bringing the experience of forty years' study. Quoting the words from the private letter of a friend; "The study of plants, I believe, is conducive to longevity, but cannot confer immortality. We can only gather whilst the summer lasts and winter must come at last 'to shake all our buds from blowing.'"

The White Pine.—Mr. W. H. Ballou, of Evanston, read a paper before the American Association for the Advancement of Science, at Cincinnati, in which occurs the following passage with reference to the origin of the White Pine in Michigan:

The first thought suggested is relative to the origin of the white pine forests. From whence came the species which so strictly confines itself to its own peculiar territory? The oak and most other trees are naturally reproductive, and young trees are equally prolific in their growth on the same soil where the first forest was leveled to the ground. They may be transplanted on almost any territory, and without any special care, speedily growing up to a state of usefulness to man. Not so with the white pine. It is now an almost undisputed fact that it will not reproduce on the parent soil, and that when transplanted elsewhere, its development is marked with early decay in so many instances as to disparage the work. Furthermore, it is beset at once with the same host of natural enemies common to it on indigenous ground.

For some years past my attention has been directed to some facts which may have bearing on the question under consideration. The pine of the level country east of the Rocky Mountains seems to have its best growth in proximity to the lake region. I have noticed that frequently, where a lake recedes, leaving a sandy beach, evergreens, the juniper, pines, etc., are very apt to spring up. Within the memory of man, a wide sand beach near Waukegan has been made, and on this area a miniature white pine forest has appeared, and thrives. On some lone islands in Lake Erie, of evident recent formation, called the East Sister, the Old Hen, etc., I observed several years since that a similar phenomenon had occurred. These

and other facts point to a recent origin of the pine forests under consideration, which might not have been in existence at the time of the landing of Columbus. This fact is more apparent when it is stated in this connection that the average age of the pine is less than three hundred years in this country; and the other fact is reiterated that it does not reproduce on the same soil. The present pine forests, then, doubtless took the place of some other species, which had exhausted the soil necessary to their existence, a phenomenon well known to naturalists. It matters not whether the seeds were blown there by the winds, or lay dormant in the soil until their turn, or, indeed, what the speculation concerning them is, so long as the facts are inaccessible; certain it is the origin of the pine forests in Michigan is a matter of several centuries ago.

Ueber die weiblichen Bluethen der Coniferen, von A. W. Eichler, Berlin, 1881 (a pamphlet of 32 octavo pages, and a double plate).—In this interesting paper Professor Eichler frankly avows that his views respecting the female flowers of Coniferæ have undergone some important changes since the publication of his Bluethendiagramme. The views now held are, as he states, essentially those found in Sachs' Lehrbuch, but he adduces copious illustrations in support of them, and adds a succinct history of the controversy regarding gymnospermy. Since the time of Robert Brown most botanists have held that the ovules of Coniferæ are naked, while a few have considered them as ovaries with single ovules. The main point, however, in the late discussions has been with respect to the nature of the bodies, often scale-like, from which in most cases the ovular structures arise. Notwithstanding their flatness, the scales have been looked upon by some as axial in their character; by others as leaves and hence carpellary. From the short extract which is translated below it will be seen that the author does not regard it as impossible to harmonize the conflicting views, at least in part. "In all Coniferæ, the scales of the so-called female ament represent nothing but simple leaves; the inner scales, where they are met with, being ventral outgrowths therefrom. The ovules take their origin either on the inner surface of these leaves or in their axils (in *Taxus* and *Torreya* only, they appear at the apex of a special bracted axis. In these two genera the ovules are to be regarded as female flowers; in all the other genera the ament represents collectively the individual female flowers, the leaves being open carpels.). At first sight there appear to be important morphological differences which, in a family so conspicuously natural as Coniferæ, we should not expect to find. Thus in one case the ovule seems to be an appendage of the leaf, in another, axillary and therefore seemingly an axillary shoot, and, thirdly, a body at the end of a leafy axis. But these differences are not so great as they appear. The ovule has the character of a macrosporangium, and may perhaps rightly bear this name, as many have proposed. Therefore, what we see realized in a macro-

sporangium (or in a sporangium in general) ought not to surprise us in the case of an ovule. Now it is certain that in *Isoetes*, the sporangia stand on leaves, in *Selaginella* and *Lycopodium* in the axil of the leaf, in *Psilotum* and *Tmesipteris* (as Göbel has lately pointed out) at the apex of a leafy axis. All these genera belong to the same circle of relationship, and also to the very one from which the Coniferæ have descended. The variations therefore serve to strengthen rather than to weaken our position. To be sure, we must give up the notion that the ovule represents either a leaf-segment or a bud, or has been derived from a metamorphosis of one of these two structures; it is the macrosporangium inherited by the phanerogams from the higher cryptogams, but more or less transformed and taking on, like that, a structure *sui generis*. It can be compared to an outgrowth ("emersion"),but it must not be regarded as the exclusive privilege of leaves, or as exclusively axial. The ovule may take its origin like other outgrowths from one organ, or another, or at the limits of the two (that is, in the axil of a leaf). This is plainly so in Coniferæ, as we have seen, and is the case in Angiosperms beyond a doubt." A minor question is incidentally discussed in the paper and again treated of in a subsequent pamphlet by the same author (Ueber Bildungsabweichungen bei Fichtenzapfen, Berlin, 1882). Monstrosities in the scales of fir cones had been adduced by some writers as evidence that the seed-scales are not simple but compound structures. A re-examination of the specimen used in support of this theory, and a study of other new examples have served to convince Professor Eichler that the carpillary "scale is a simple organ, but that by the appearance of a bud on the posterior aspect, it may undergo all kinds of deviations, and even split into two or more often three leaf-like lobes."—G. L. GOODALE.

Githopsis.—Baillon in Bull. Soc. Linn., Paris, no. 38, p. 304, states that besides wild specimens of *G. specularioides*, the herbarium of the Museum at Paris has specimens raised from Texan seeds in the Botanic Garden at Cambridge, which show that the capsule dehisces by triangular "*panneaux*" below the calyx; wherefore the genus subsides into *Specularia*. Now *Githopsis* is unknown in or near Texas, and has never been raised in the Cambridge Garden. *Specularia Lindheimeri* is Texan and has been cultivated here. It appears that Baillon has taken this for *Githopsis*.—A. GRAY.

Notes on Ambrosia trifida.—Last year I made quite extensive researches as to the facilities presented by weeds for the dissemination of seeds, hoping thereby to gain a true insight into their nature. The results show that an explanation is not to be sought here, but in their tenacity of life when injured, their power of de-

veloping branches in the lower axils of leaves, from roots, &c. Indeed, many weeds are almost destitute of arrangements for the distribution of seeds. One of these is the common ragweed, *Ambrosia trifida*. In this I noted an occurrence, properly belonging to the study of Natural Philosophy, but which may interest even the botanist. The akenes of this plant have a stout central process, ⅓ the length of the seed, surrounded at the base by five slight protuberances. On a clear morning, when the fields are covered with hoar-frost, go out into the fields in which this plant grew last summer. Wherever there is a seed exposed you find 5 or 6 strands of ice attached to these processes, sometimes separate but oftener in contact with one another, resembling asbestos in the arrangement of the "fibers" of ice. These, after making various contortions, resembling locks of hair, reach a length of 1½ to 3 inches. During winter season the akenes are mostly half-buried by the earthy matter around them, but in the fall they lie loose on the ground. Now for our application to botany. The seeds being quite heavy generally are carried but a short distance from the stem; but when attached to these strands of ice, they are carried away by the winds, rolling over the ground; or the feet of animals in striking the ice —which always rises above the ground, often nearly perpendicular —propel the seed with the ice; and most frequently of all, becoming by this means attached to leaves, light twigs, &c., they are carried by these for short distances, which during the entire winter season, may amount to a considerable distance, for a plant presenting no other facilities.

Why do not other seeds, as well as our common ragweed, have these curls of ice? Or have they been noticed elsewhere? No doubt this plant offers peculiar facilities in this direction. The seeds present an extraordinary amount of surface by means of these processes, radiation of heat being more advanced here, they offer the first attachment for the dew, which precipitated on the seeds, forms the curls of ice, while at the same time the processes give direction to the strands thus formed, and instead of an irregular mass of ice we have "ice-curls."—AUG. F. FOERSTE, *Dayton, Ohio.*

Depauperate Rudbeckia.—An interesting instance of the change which may be effected in the habit and growth of a plant, came to my notice last fall. One day while out walking, I came across a specimen of *Rudbeckia hirta*, L., which was to me a curiosity. The leaves were all radical, and the solitary flower was on a veritable scape, leafless and bractless. The leaves and flower were of the typical *R. hirta*, but instead of the plant being tall and branched as it is usually, it was only two inches high. The next week my brother found another specimen of the same description. This latter was a little taller, being about six inches high to the top of the scape, but all the leaves were radical and the scape was leafless. This is an interesting instance of the way in which a

long period of hot and dry weather can reduce a tall branching plant, to a low branchless one, and may show under what influences plants may acquire the leafless scapes and radical leaves which are characteristic of so many species.—Jos. F. JAMES, *Cincinnati, Ohio.*

Proterandry in Amaryllis reginæ.—The species here named is now occasionally cultivated from South America as a house plant, for which purpose it possesses many desirable characteristics. The large crimson-red, nodding flowers exhibit proterandry in a manner easily observed. The stamens are in two sets of three each, the outer being somewhat shorter than the inner. They are all nearly straight at first but soon begin to curve upward.

The anthers are versatile, and when first appearing are ¾ of an inch in length. From six to ten hours after the flower opens the dehiscence of the anthers takes place by a gradual splitting open on each side, the valves rolling up so as to hide their external surface completely from view; or in other words the anther is turned inside out. At the same time the valves become fluted like a ruffle thereby shortening the anther so that when the dehiscence is complete the anther is only about 3-16 of an inch long. The dehiscence takes place in the short stamens about four or five hours before it does in the long ones. The pollen is very abundant, forming nearly one-half the bulk of the anther. The styles of the three-celled ovary are united into one, with a three-lobed stigma. During the dehiscence of the anthers the stigma remains closed, and is turned downward away from the anthers, thus preventing any pollen from coming in contact with it. After about twenty-four hours the style curves upwards, and the lobes of the stigma turn back, or open, and are ready to receive the pollen. This, however, must now come from a fresh anther of another flower. From the structure of the flower, and the character of the pollen it is well nigh impossible that the latter could be brought to the stigma by the wind. No doubt, therefore, this Amaryllis in its native region is wholly dependent for its fertilization upon some insect, probably some moth with a long proboscis. To this end a liberal supply of nectar is secreted at the bottom of the perianth.—J. TROOP, *Botanical Laboratory, Ithaca, N. Y.*

Grape Mildew.—In the GAZETTE for March I stated that the conidia of *Peronospora viticola* were not known to occur on the flowers and young berries of the grape in this country. The remark is untrue as far as the Western States is concerned, for in the Transactions of the St. Louis Academy of Science of Sept. 16, 1861, Dr. Engelmann mentions that in Missouri the fungus appears in June, and on the pedicels and young berries when they are of the size of small peas or smaller, although he had never seen it on full grown berries. The early occurrence of the fungus in Missouri

would accordingly account for the fact that the vines suffer more from the fungus in the Western than in the Eastern States.—W. G. FARLOW.

Notes from the Mississippi Pine Barrens.—The winter has brought little cessation in vegetable activity. With the late blooming fall flowers, Asters, (especially *A. squarrosus* and *A. adnatus*), *Ascyrums* and *Lobelia glandulosa*, would open now and then, a belated Cape Jasmine, and a second bloom of several spring flowering plants. Pear trees and apricots bloomed throughout November; *Gelsemium sempervirens* on Nov. 22nd, and *Crataegus Pyracantha* during the first week of December. *Stellaria media* has been in continuous bloom. The thirty rainy days in the month of January gave no opportunity for rambles in the Pine Woods, but *Arabis Ludoviciana* appeared January 7th, and *Houstonia minima* on the 10th. The gardens were fragrant with English violets, Hyacinths and Narcissi, *N. Polyanthus* opening first on Christmas day. In *N. Tazetta*, the polymorphism of the perianth is very frequent, occurring with but three, or sometimes four divisions in the same umbel with the normal flowers. The number of stamens is also reduced to correspond with the perianth. From day to day an adventurous rose would open. The dainty *Rosa Banksiae* first appeared, January 19th. *Magnolia purpurea* and *Pyrus Japonica* were in bloom February 2nd, when the Yellow Jessamine was again opening in sheltered spots. On February 4th the ground, in moist places, was starred with *Ranunculus fascicularis;* the dark-eyed, purple *Houstonia* was everywhere abundant; *Viola primulaefolia, Prunus Caroliniana, Vaccinium tenellum* and *Allium striatum*, were blooming, and over the Barrens many mosses were beautifully in fruit.—MARTHA B. FLINT, *Brookhaven, Miss.*

New Species of Fungi; by Chas. H. Peck.—CANTHARELLUS MORGANI.—Pileus thin, plane or centrally depressed and subinfundibuliform, glabrous, red, the margin involute; lamellæ narrow, decurrent, dichotomously branched, whitish; stem equal or slightly enlarged above, solid, paler than the pileus; spores minute, subelliptical, .00016—.0002 of an inch long.

Plant 8–12 lines high, pileus 6–10 lines broad, stems 1–2 lines thick.

Under coniferous trees. Vermont. *A. P. Morgan.*

This is a small species resembling *C. Guyanensis* Mont., which, according to the description, differs in its thick coriaceous reddish-orange pileus, yellow hymenium and thick corneous fistulose stem. The pileus in our plant has a light-red or pinkish-red color, and I do not detect any peppery taste to the flesh.

POLYPORUS FRAXINOPHILUS.—Pileus sessile, thick, corky, more or less ungulate, somewhat decurrent, concentrically sulcate, rimose

when old, the first year whitish, then gray or cinereous, finally black, the margin obtuse, the substance obscurely zoned within, at first whitish, then isabelline; pores medium size, stratose, nearly plane, subrotund, the dissepiments obtuse, entire, whitish; spores white, broadly elliptical, .0003–.00035 of an inch long, .00025–.0003 broad.

Pileus 2–4 inches long, 1–2 inches broad.

Dead or languishing trunks of ash trees. Dakota. *C. W. Irish.* Arizona. *C. G. Pringle.*

This Polyporus belongs to the FOMENTARII. It varies considerably in shape, some specimens being almost as much flattened as the thicker forms of *P. applanatus*, others being as thick as the ordinary forms of *P. fomentarius*. Specimens three or more years old are somewhat tri-colored, the oldest part being black and full of chinks or cracks, the margin whitish and the intermediate part gray or cinereous. The annual additions are separated by concentric grooves. In the Dakota specimen the annual additions are much broader than in the Arizona specimens, and the pileus is more flattened and thinner. The interior substance is at first whitish but it changes with age to a brownish-yellow or isabelline hue, thus forming a connecting link between the second and third sections of this tribe as given in the Epicrisis of Fries.

MERULIUS RUBELLUS.—Pilei mostly cæspitose, imbricated, sessile, dimidiate, soft, somewhat tenacious, tomentose, deep-red when fresh, paler when dry, the margin usually undulate, inflexed; hymenium whitish or cream-colored, the folds much branched, porous-anastomosing; spores minute, elliptical, colorless, .00016–.0002 of an inch long, .0001–.00012 broad.

Pileus 2–3 inches long, 1–2 inches broad; tufts sometimes six inches long.

Decaying trunks of beech trees, *Fagus ferruginea*, in dense woods. Near Cincinnati, Ohio. December. *A. P. Morgan.*

This is a beautiful species, similar to *M. tremellosus* in the size and thickness of the pileus, but very different in color. The fresh moist pileus is a deep red (Indian red) but in drying it fades to a pinkish-gray or to a grayish hue with a red margin. The texture is almost floccose-tomentose, with the upper part red, the lower white. According to the notes sent me by Prof. Morgan, it differs from the description of *M. incarnatus* in the pileus not being "coriaceo," the folds neither "subtremellosis" nor "luteis roseisve," the mode of growth not "stellatim provenit" and the habit not being "ad cortices dejectos *Quercus albæ, falcatæ*," although fallen trunks of *Quercus alba* were more abundant in the locality where it was collected than were those of the beech.

PUCCINIA BRANDEGEI.—Spots none, sori amphigenous or caulincolous, often confluent, reddish-brown, distorting the stems and petioles; spores subelliptical, smooth, .0011–.0014 of an inch long, .0008–.001 broad; pedicels short.

Living leaves and stems of *Corydalis Brandegei*. Colorado. *T. S. Brandegee*.

PUCCINIA BOISDUVALLÆ.—Spots indefinite, yellowish, often tinged with red or brown; sori few, scattered, amphigenous, brown; spores obovate or oblong-elliptical, obtuse, slightly constricted at at the septum, smooth, .0014–.0016 of an inch long, .0008–.00095 broad; pedicels short, colorless.

Living leaves of *Boisduvalia Torreyi*. Santa Cruz, California. *M. E. Jones*.

UROMYCES JONESII.—Spots none; sori amphigenous, small, scattered, reddish-brown; spores subglobose to elliptical, verruculose, .0011–.0014 of an inch long, .0009–.0011 broad; pedicel short, colorless.

Living leaves of Ranunculus. Soda Springs, California. *M. E. Jones*.

The roughly warted spores and scattered amphigenous sori are notable features in this species.

TRICHOBASIS WYETHIÆ—Spots none; sori dot-like, abundant, often occupying the whole lower surface of the leaf, reddish-brown; spores subglobose or broadly elliptical, .0012–.0016 of an inch long, .0008–.0012 broad.

Living leaves of *Wyethia angustifolia*. Colorado. *T. S. Brandegee*.

TRICHOBASIS HELIANTHELLÆ.—Spots pale greenish; sori hypophyllous, numerous, generally most abundant along the midrib, reddish-brown; spores globose or subglobose, uninucleate, .0012–.0014 of an inch in diameter.

Living leaves of *Helianthella Californica*. Soda Springs, California. *M. E. Jones*.

Plucheas.—*Pluchea camphorata*, *P. fœtida*, and even *P. purpurascens*, DC., appear to be forms of one variable and widely diffused species. Is the plant of the Mississippi valley found growing anywhere far from subsaline soil, and is the root perennial? Is the root of *P. camphorata* ever perennial?—A. GRAY.

On the Power possessed by Leaves of placing themselves at Right-Angles to the direction of Incident Light; by Francis Darwin. Journal of the Linn. Soc., no. 112 (vol. xviii, pp. 420–455), published June, 1881, read Dec. 16, 1880.—Taking up this subject where it was left by his father and himself in the work on "The Power of Movement in Plants," Mr. Francis Darwin, in this paper, records his investigations and experiments made with a well-devised modification of Sachs' Klinostat, with the view of determining whether Frank's or DeVries's explanation of the position which leaves normally assume with respect to the light is the more

tenable. While the vertical position assumed by the growing plant's axis is attributed to geotropism and heliotropism, Frank attributes the position taken by leaves (with one face to the sky and the other to the ground) to transverse geotropism and transverse heliotropism. "An organ which grows transverse-geotropically, places itself horizontally..... In the same way a transversly heliotropic organ has an inherent tendency to place itself at right-angles to, instead of parallel [as does the stem] to the direction of incident light. It may be said that this is no explanation at all; and this is true in a certain sense. But there is no reason why it should be more unsatisfactory than the accepted explanation of the vertical growth of stems and roots, namely, that they have an inherent power of growing in these directions." Indeed the one is just as satisfactory or unsatisfactory as the other. The terms "geotropism," "heliotropism," "apheliotropism" and the like, transverse or otherwise,—now a numerous brood,—are useful and not misleading, when held to mean only that, in fact, a leaf "has an inherent tendency to be horizontal," or "to place itself at right-angles to the direction of incident light" and "the hypocotyl of a seedling has an inherent tendency to grow vertically upwards. "The technical terms are unsatisfactory only when they are supposed to carry more explanation than the simple and untechnical statement does. But do leaves take their position in virtue of an inherent tendency? This is substantially denied by DeVries,or at least he maintains that the assumption is needless, for that it may be the result of an antagonism between positive and negative heliotropic and geotropic forces, or between these and what he calls *epinasty* and *hyponasty*. These new technical terms are simple in meaning. An organ, such as a leaf, is epinastic when the upper half grows in length more than the lower, and the effect is convexity above and concavity below, or downward curvature: it is hyponastic when the reverse takes place. And the suggestion is, that the horizontal position of a leaf under zenith illumination may be due simply to an equilibrium between two or more of these opposing forces. It is unnecessary to enter into particulars of how this obviously might produce the effect: for the result of Mr. Francis Darwin's experiments is a clear disproof of DeVries' suggestion. In the "fundamental experiment:..if a plant whose leaves have the power of placing themselves at right-angles to incident light is growing normally in the open air and lighted from above, its leaves will be horizontal. Let the plant be now made to rotate on a klinostat [so slowly that no centrifugal effect will be produced, but rapidly enough to destroy all geotropic action] so that the axis of rotation coincides with the axis of the plant. And let the direction of the incident rays of light be parallel to the axis of rotation, so that the morphologically upper side of the leaves is illuminated by rays striking them at right-angles, just as they were when the plant grew on the ground. Then, if the normal horizontal position is the result of a balance between geotropism

(positive or negative) and any other force—epinasty, hyponasty, positive or negative heliotropism,—it is clear that, geotropism being destroyed by the rotation, the balance cannot be maintained." The experiments, varied in many ways, and with arrangements to eliminate epinastic and hyponastic tendencies, plainly bring out the conclusion "that the power which leaves have of placing themselves at right-angles to the incident light is due to a specialized sensitiveness to light, which is able to regulate or govern the action of other external forces, such as gravitation, or of internal forces, such as epinasty."—A. G. *in Am. Jour. Sci.*

Ranunculus.—I invite attention, this season, to the various forms which in this country pass under the name of *Ranunculus repens*, L. I suspect that the European species, one which merits the specific name, is not indigenous to the United States, but is occasionally met with as a naturalized plant. The "third form" with "spotted leaves," mentioned in Mr. Ward's new Flora of Washington, would seem to be of this species. Does the low and early-flowering form of our common species make runners later in the season? And do the larger forms of low ground freely produce prostrate shoots and do these take roots?"—A. GRAY.

Botanizing on Comanche's Peak, Texas.—This high bluff is one of the most remarkable features of Central Texas. Situated six miles south of Granbury, it towers above the beautiful valley of the Brazos like an immense citadel, its height above the valley being estimated at six hundred feet. It is seen from long distances in every direction and from its top a most extensive view is obtained. Like an isolated sentinel, it seems to be the only remnant of a vast plateau that has been washed away. Belonging to the Cretaceous Period, its rocks full of interesting marine fossils have characterized one group of that period, bearing the name of *Comanche's Peak Group.*

In September, 1881, my wife and I visited the peak on a botanizing expedition, but the season was not favorable except for a few grasses which I will mention below. The *Euphorbia Fendleri* and *Paronychia Jamesii* were the only interesting plants in bloom. On the rocks which had fallen from the top of the peak we noticed some *Solidago nemoralis* in bud, but most of the species were detected by means of leaves, or dried stems bearing seeds; such as *Arenaria Michauxii*, *Erythræa Texensis*, *E. Beyrichii*, and *Sabbatia campestris.* We looked eagerly for ferns, but only two were obtained, *Pellæa atropurpurea* and *Notholæna dealbata*, of the latter only a small specimen. The pretty *Cereus pectinatus* is also growing there, being, I think, one of its more northeastern stations.

The grasses were; 1, a *Bouteloua* much resembling *oligostachya* but with culms 2 or 3 feet high and that in poor rocky soil; 2, *Leptostachya dubia*; 3, *Tricuspis* (probably *mutica* of Torrey); 4,

Aristida, probably a new species. The last three species were growing on rocks on the very top of the peak. The first is abundant in rocky prairies near the base of the mountains. I have sent these grasses to Dr. Vasey of the Department of Agriculture, and he has not yet reported definitely about them.

The sides and part of the top of this great bluff are covered with a thick growth of mountain cedar (*Juniperus occidentalis*, var. *conjungens*), red oak (*Quercus rubra*), live oak (*Q. virens*), and shin oak (*Q. sinuata*, var.?). Among these we noticed the following shrubs; *Celtis reticulata*, *Ptelea trifoliata*, var. *mollis*, *Morus parvifolia*, *Rhus trilobata*,and the curious evergreen *Berberis trifoliata*.

I have no doubt that the locality is very rich in plants, and the botanist who will visit it in a good season will be well repaid for his trouble, besides the pleasure of viewing beautiful landscapes.

The settlers about the peak have assured us that they are generally favored with more or less rain while the country 8 or 10 miles distant is suffering from drouth. Some of our own observations seem to corroborate this statement.

In crossing the Brazos 6 miles from the peak we found on the sandy banks of that river fine blooming specimens of the following species: *Heliotropium convolvulaceum*, *Euphorbia hexagona*, *Dalea lanata*,*Aster spinosus*,*Cycloloma platyphylla*, and *Enslenia albida*.—J. Reverchon, *Dallas, Texas*.

North American Grasses.—In the April *Naturalist* Dr Vasey gives some notes on N. Am. Grasses,based on Mr. Bentham's recent paper on *Gramineæ*. As all botanists are interested in the proposed changes we will note a few of those that most concern us. *Polypogon* is placed under the *Panicaceæ*. *Thurbera* is a new genus made to include two species of hitherto doubtful relations, and most happily named. *Sorghum nutans* is not *Sorghum* at all, but *Chrysopogon*. *Sorghum* includes only the cultivated *S. vulgare* and *S. Halapense*. *Muhlenbergia* is made to include *Vaseya*. *Sporobolus* includes *Vilfa*. In *Deyeuxia* are included all our species of *Calamagrostis* except two or three which go into *Ammophila*. All our native species of *Aira* are referred to *Deschampsia*. *Lepturus paniculatus*, Nutt., is referred to *Schedonnardus*. *Eleusine* includes *Dactyloctenium*. *Leptochloa fascicularis* again appears as *Diplachne fascicularis*. *Triodia* includes *Tricuspis* and *Uralepis*. *Triplasis* appears with two N. Am. species. Our *Brizopyrum* is *Distichlis*, Raf. *Briza* includes *Calotheca*. *Atropis* is referred to *Glyceria*. *Bromus* includes *Ceratochloa*. Our native *Triticums* are referred to *Agropyrum*. *Gymnostichum* is referred to *Asprella*.

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Editorial.—THE AMERICAN FORESTRY ASSOCIATION held its first annual meeting in Cincinnati, April 25–29. With Dr. John A. Warder as President, the convention could not well help being one of great interest.

MR. THOMAS MEEHAN writes that the European snowdrop flowered near Philadelphia on the 1st of April this year, and that *Fritillaria pudica*, within a few feet of it, was only four days after.

JOSEPH DECAISNE, the most eminent botanist in France, the director of the *Jardin des Plantes* ever since the death of Mirbel, the Professor of Culture in the Museum of Natural History at Paris for more than forty years, died on the 8th of February, 1882, in the 75th year of his age.

WE HAVE JUST RECEIVED information of the death of Mr. William H. Leggett, for so long a time the editor of the *Torrey Bulletin*. He died April 11th and in the absence of particulars we will await the notice which will appear in the journal with which he has been so honorably connected.

MR. THOMAS HOWELL, of Sauvies' Island, Oregon, has published a catalogue of the plants of Oregon, Washington, and Idaho, including the mosses. He offers to furnish botanists their desiderata at ten cents, and full sets at five cents per species. Mr. Howell's plants have proved very satisfactory.

THE AGRICULTURAL COLLEGE at Lansing, Michigan, seems to have quite an active Natural History Society, judging from accounts of it given in *The College Speculum*. Prof. W. J. Beal, of course, contributes largely to the botanical interest, but the best of it is that he is ably assisted not only by professors but by students.

PART V, OF DR. BRAITHWAITE'S British Moss-Flora, published at the close of the last year, has come to hand. It contains *Leucobryum* and a part of the *Dicranaceæ*. Twenty-five species are beautifully figured on the three plates. This work is specially recommended to American botanists. Even if we get our long hoped-for Manual, we shall still need an illustrated work like this.

PROF. C. E. BESSEY has recently met with a severe loss which calls forth the sympathies of his many botanical friends. On April

8th a tornado struck North Hall of Iowa Agricultural College, carrying off the roof and crushing in the botanical laboratory, botanical lecture room, and the room in which were the Professor's library, cabinet and herbarium. His work is now carried on in another building. The herbarium is saved in packages, but the case is still in the wrecked building, exposed to rains and storms. The library was mostly saved, but badly hurt by rain, lime and crushing. The building is to be repaired soon and the Professor expects to be back in his old quarters by midsummer.

MR. VOLNEY RATTAN has published a popular "California Flora," or "Manual of Botany for Beginners," which has just appeared in a third edition, revised and enlarged. It contains some introductory lessons and condensed descriptions of plants with conspicuous flowers, numbering something over 600. The most difficult orders, such as *Umbelliferæ, Compositæ*, etc., are not described, being too difficult for beginners. The book seems a most excellent one for its purpose, and well calculated to be a stimulus to the study of botany in the schools of California. Many a book of this kind has come from the necessities of an enterprising teacher, for our specialists will not always attend to the wants of beginners.

THE GREAT COLLECTIONS of the late Professor E. Fries, are now offered for sale by his heirs. They consist of an herbarium of extra-Scandinavian phanerogams of about 40,000 species; an herbarium of Sandinavian phanerogams, complete and containing the types of Prof. Fries' works on the Flora of Scandinavia; a collection of fungi, containing original specimens of Prof. Fries' own species and of those of almost all other mycologists in this century; a collection of about 1,500 drawings of fungi, most of which are colored; a collection of mosses; a collection of algæ; *exsiccata* published by many authors. All these collections have been well taken care of, and the phanerogams are mounted upon fine white paper. They will be sold undivided or in families or genera, and purchasers should address Th. M. Fries, Upsala, Sweden, before the end of May, stating the price offered per hundred.

REV. A. B. HERVEY, of Taunton, Mass., has prepared some exceedingly handsome slides of marine algæ. They are divided into two sets of six each. Set 1 shows the characteristic fruit of each of the 6 groups into which the *Florideæ* or red algæ naturally divide. Set 2 shows 3 different forms of the asexual spores of the *Florideæ*, and the sexual fruit of the lower algæ, viz: the *Cryptophyceæ, Zoosporeæ, Oosporeæ*. The writer must acknowledge that these slides came nearer filling a "felt want" in his laboratory, than any appliance has done for many a day. Heretofore his students had to exercise a large degree of faith in regard to the reproductive parts of these low and very interesting forms, but now seeing strengthens both belief and interest. As an educational series these slides are invaluable, and no laboratory or lecture room can afford

to be without them for they really illustrate every important feature of the reproductive machinery of the algæ. Either set costs $3.00, both together $5.00, with full explanatory text.

THE WRITER CONFESSES a delinquency which he wishes to correct both in himself and his botanical friends. We have an Association known as the American Association for the Advancement of Science, where workers in all departments of science are in the habit of meeting to have most pleasant and profitable intercourse. Zoologists, geologists, chemists and mathematicians flock to it in great numbers, but botanists are both few in number and modest in spirit. Where are the possessors of those long lists of names which fill page after page of our directories? There is now a section of biology where botany will have a fair chance, and botanists should avail themselves of this opportunity of becoming acquainted with each other. The next meeting will be held in Montreal, August 23d, as attractive a place for meeting as could well be imagined. The writer expects to be there, he is ashamed to say for the first time, and hopes to make hosts of botanical acquaintances. He does not offer his presence as an inducement for any one to attend, but simply to assure his readers that he intends to follow his own advice. Let us begin thus early to lay our plans for making the botanical subsection a very prominent feature of the next meeting. Go prepared not only to see something but to say something.

CHARLES ROBERT DARWIN died April 20, 1882. Just as we go to press this telegram has been received from London, accompanied by no particulars. He was born February 12, 1809, and the history of his long life is the common property of all intelligent people. Seldom has there been a life more busy or more fruitful, for it must be conceded that his powers of observation were phenomenal. His name has become so much a part of modern biology that it can never cease to be a familiar one. A great "path-breaker," many have followed in his footsteps and he had the good fortune to live long enough to see his work properly appreciated. It is almost needless to name his contributions to botany, for his books are in every library. Those with botanical subjects are as follows: "Fertilization of Orchids," "Insectivorous Plants," "Climbing Plants," "The Effect of Cross- and Self-Fertilization in the Vegetable Kingdom," and "Different Forms of Flowers in Plants of the same Species." His last book was upon the "Effect of the Earth-Worm on Vegetable Mould."

We may expect a notice in some degree worthy of the man from the pen of him who of all in this country knew him best, and with whom his name is so pleasantly associated in that delightful book, "Darwiniana."

BOTANICAL NECROLOGY for 1880, 1881 and thus far in 1882, as given in the *American Journal of Science* for April includes the following names:

Gen. Wm. Munro died near Taunton, England, Jan 29, 1880, at the age of 64.

Coe F. Austin, Closter, N. J., died March 18, 1880, at the age of 49.

Wm. Philip Schimper died March 20, 1880, at the age of 72.

Nils J. Andersson died at Stockholm, March 27, 1880, at the age of 59.

Dominique Alexandre Godron died at Nancy, August 16, 1880, at the agé of 73.

S. B. Mead, Augusta, Ill., died November 11, 1880, at the age of 81.

W. Lauder Lindsay died November, 1880, at the age of 52.

Ernst Hampe died November 23, 1880, at the age of 85.

Alphonso Wood, West Farms, N. Y., died Jan. 4, 1881, at the age of 70.

Gottlieb Ludwig Rabenhorst died near Meissen, in Saxony, April 24, 1881, at the age of 74.

Matthias Jacob Schleiden died at Frankfort on the Maine, June 23, 1881, at the age of 77.

Theodore Schwann died at Liege, Belgium, early in the present year, at the age of 70.

Joseph Decaisne died at Paris, February 8, 1882, at the age of 74.

Thomas Potts James died at Cambridge, Mass., February 22, 1882, at the age of 78.

Wm. H. Leggett died in N. Y. City, April 11, 1882.

Charles Robert Darwin died April 20, 1882, at the age of 73.

The Genus Isoetes; by Dr. George Engelmann.—This is a pamphlet of 33 pages from the Transactions of the St. Louis Academy, Vol. IV, No. 2, and was read in February of this year. This insignificant genus was for a long time ignored by botanists and until thirty or forty years ago, the few specimens that were collected were referred to *I. lacustris*. Of course a genus that was attractive to no one else was just the one for Dr. Engelmann to study and the result is that we now wonder why so interesting a genus was not studied long ago. At least this pamphlet will spur us all to activity and its author will begin to hear frequently of more Isoetes. This paper is remarkable for its completeness, containing all the information pertaining to the genus that can be given at the present time, though, to be sure, the literature of the subject has not yet become very extensive. First the author gives the history of the genus in North America, giving a complete list of the discoveries of the various species, from that of Pursh in 1806 (?) to that of the author and Mr. Pringle in 1881. Under the same heading is included a list of publications in reference to the genus.

Then follows an account of the morphology and biological elements of the members of this genus, the simplest vascular plants

known. The lobing of the trunk, the presence or absence of stomata, and the peripheral bast-bundles are noted as furnishing valuable characters for classification. The rarest patience has been shown in the careful dissection of tissues in hundreds of specimens not in all cases the best. The author advises any one who desires to study the structure of Isoetes to begin with the well known species and fresh specimens. The arrangement of the leaves varies from distichous to even the 21-34 order; their number from 5 or 10 to 100 or even 200; their length from ½ to 1 inch to 1 or 2 feet. The genus contains from 40 to 60 species, North America having 14, with 12 varieties. The systematic arrangement proposed is as follows:

I. TRUNK BILOBED.

A. Submerged species with quadrangular leaves, without. or in 4 and 5 with few or many stomata, and without peripheral bast bundles; velum incomplete.

1. *I. lacustris.* 2. *I. pygmæa.* 3. *I. Tuckermani.* 4. *I. echinospora.* 6. *I. Bolanderi.*

B. Amphibious species with abundant stomata in the quadrangular leaves.

* Without peripheral bast-bundles (these are intermediate between the submerged and the truly amphibious species).

† Velum partial.

6. *I saccharata.* 7. *I. riparia.*

†† Velum complete.

8. *I. melanospora.*

** With peripheral bast-bundles.

† Velum partial.

9. *I. Engelmanni,* 10. *I. Howelli.*

†† Velum complete.

11. *I. flaccida.*

C. Terrestrial species, maturing when entirely out of water, with abundant stomata and peripheral bast-bundles in the nearly triangular leaves.

* Velum partial or almost wanting.

12. *I. melanopoda.* 13. *I. Butleri.*

** Velum complete.

14 *I. Nuttallii.*

II. TRUNK TRILOBED. (Numerous stomata and bast-bundles in the quadrangular leaves; velum partial.)

15. *I. Cubana.* (From Cuba.)

In regard to geographical distribution the following quotation is made as it may be of service to collectors:

Only a small part of the North American continent has been well explored for Isoetes, and there, from Massachusetts to the Chesapeake Bay, they appear abundant enough; farther south, and in the whole interior and western part of the continent, they have thus far been found only in a few localities. Some species are quite local, as is the case, also, with many species of the old world, while others are widely distributed. Our two northern species are identical with or closely allied to European forms, all the others are quite distinct from such, so that there is scarcely more than a generic analogy between the species of our middle and southern regions with the Mediterranean ones or those of other regions of the globe.

The old Linnean *I. lacustris* is the only species which has been found to extend from the Atlantic to the Pacific States, and it probably occupies a northern belt of the northern hemisphere, though it seems not to have been discovered as yet in Asia. The American forms allied to *I. echinospora*, the other north European species, are the most common in the belt of northern States as far west as Michigan, and have been detected also on the western slope of the Rocky Mountains. Of the others, *I. Engelmanni* extends from Massachusetts Georgia and westward to Missouri, though thus far not found anywhere else west of the Alleghany Mountains. *I. flaccida* is pecular to Florida and *I. Bolanderi* to the lakes of the western mountain chain, the Rocky Mountains as well as the Sierra Nevada. *I. melanopoda* occupies parts of the Mississippi Valley from Central Illinois to Northwestern Texas, while *I. Nuttallii* is the only species found in the valley of the Columbia river. All the other species seem to be nearly or quite local, *I. pygmæa*, in the Californian Sierra, but most of them on the Atlantic border; thus *I. Tuckermani* occurs only near Boston. *I. saccharata* on streams emptying into the Chesapeake Bay, and *I. melanospora* only on that peculiar and botanically interesting rock, the Stone Mountain of Georgia. Some species which seemed local have lately assumed a little wider range, though yet quite restricted; among these I mention *I. riparia* of the banks of the lower Delaware river which occurs also further north, and *I. Butleri*, first known only from the Indian Territory, now also found in Tennessee. There can be no doubt but that some of the apparently local species will yet be found in a more extended area, when botanists will include in their researches these obscure and inconspicuous plants.

New Species of Fungi, by Chas. H. Peck.—HYMENOCHÆTE MULTISPINULOSA.—Resupinate. dark reddish-brown, the margin paler, the hymenium velvety by reason of the numerous setæ, uneven, tuberculose, cracking into small areas; setæ straight or slightly flexuous, crowded, .0025–.0045 of an inch long, arising from and often persistently attached to the paler filaments of the substratum.

Surface of decaying wood. Arizona, April. *C. G. Pringle.*

This fungus approaches, in some respects, the subgenus *Velutiepes*. The specimens are sterile. The color is somewhat darker than that of *H. corrugata.*

HYMENULA LYCHNIDIS.—Minute, punctiform, disk whitish or pallid, surrounded by a black margin; spores oblong-cylindrical or subclavate. colorless, .0005–.0008 of an inch long, .00016 broad.

Dead or languishing leaves of Lychnis. California, July. *M. E. Jones.*

To the naked eye this fungus appears like minute black dots. but when magnified the dots are seen to be the black margin, which surrounds a pale disk.

LYCOPERDON PACHYDERMUM.—Subglobose, four to six inches in diameter, the radicating base somewhat pointed, the external peridium thin, smooth, whitish, the upper part cracking into small angular persistent spot-like scales or areas, the inner peridium thick, subcorky, somewhat brittle, the upper part at length breaking up into irregular fragments; capillitium and spores ochraceous-brown, the filaments long, flexuous, somewhat branched, .0003 of an inch thick:

spores subglobose or broadly elliptical, .0002–.00025 of an inch long.

Arizona, June. *Pringle.*

This is a singular species of *Lycoperdon*, belonging to the section *Bovistoides*, but having the peridium of unusual thickness. It is also apparently destitute of any cellular base, in which respect it approaches the genus *Bovista*, but the character of the threads of the capillitium points to *Lycoperdon* as its proper genus.

Hendersonia Cerei.—Perithecia minute, hemispherical, sometimes collapsed or depressed about the papilliform ostiolum, black; spores numerous, oblong, colored, triseptate, constricted at the septa, .0008–.0009 of an inch long, about .0003 broad, the second cell from the apex sometimes divided by a longitudinal septum.

Dead wood of *Cereus giganteus*. Arizona, April. *Pringle.*

The division of the second cell of some of the spores indicates an approach to the genus *Dichomera* Cooke.*Camarosporium* Schulz.

Asteroma Pringlei.—Spots orbicular, epiphyllous, black, two to four lines broad, the tips of the radiating hyphæ sometimes dilated; perithecia convex, black, irregularly or sometimes concentrically arranged; spores large, oblong or subfusiform, generally acute at the extremities, slightly colored, .0016–.002 of an inch long, .0005–.0006 broad, often with one to three muclei.

Leaves of *Quercus hypoleuca*. Arizona, July. *Pringle.*

Most of the specimens are sterile, and those that are fertile do not appear to be in very good condition.

Ustilago cylindrica.—Attacking the spikes of the host plant and converting them into a cylindrical mass of spores six to ten lines long, about one line thick, invested by a thin cinereous at length lacerated membrane; spores subglobose, minutely roughened, brownish-black, .00035–.0004 of an inch in diameter, intermingled with large irregular unequal pale cellular bodies .0008–.0014 of an inch broad.

Grass. Arizona, June. *Pringle.*

The host plant is probably some species of *Andropogon*. The cylindrical mass into which the inflorescence is converted by the fungus resembles somewhat the ergot of rye in external appearance, but it is usually more slender than the ergot. The rachis forms a white central columella which runs through the mass of spores.

Pileolaria effusa.—Forming a continuous or circumambient velvety reddish-brown stratum over the young branches, petioles and leaves of the host plant; spores subglobose, minutely roughened, .00096–.0011 of an inch in diameter, uninucleate; pedicel short, colorless, .0005–.0008 of an inch long.

Living branches and leaves of Rhus, probably *R. aromatica* or *R. triloba*.

Arizona. May. *Pringle.*

This is very distinct from *Pileolaria brevipes*, our eastern

species, both in its effused mode of growth and in its much shorter pedicel, whose length is scarcely equal to the diameter of the spore.

UROMYCES COMPACTA.—Spots none or obsolete; sori compact, orbicular or oblong, blackish-brown; spores elliptical or oblong, obtuse or bluntly pointed, .0014–.0019 of an inch long, .0009–.001 broad; pedicel colorless, equalling or exceeding the spore in length.

Dead stems of some "Composite plant." Arizona. May. *Pringle.*

UROMYCES VERSATILIS.—Spots none; sori numerous, minute, amphigenous, rotund or oblong, slightly elevated, ochraceous-brown; spores oblong or oblong-pyriform, generally separating from the pedicel when old, .0009–.0012 of an inch long, .0005–.0006 broad; pedicel short.

Living branches, petioles and leaves of *Acacia Greggii.* Arizona. May. *Pringle.*

This is an aberrant species, and approaches *Trichobasis* in its deciduous spores. The young spores are subglobose and borne on pedicels larger than themselves, thus resembling the paraphyses of some species of *Lecythea.* The color of the spores is pale ferruginous, or reddish-brown with an ochraceous tint. The fungus is abundant on the young branches as well as on the leaves of the host plant.

PUCCINIA GAYOPHYTI.—Spots none; sori small, scattered, amphigenous, reddish-brown; spores obovate or subelliptical, generally constricted at the septum,,,obtuse, smooth, .0012–.0016 of an inch long, .0008–.00095 broad; pedicel short, colorless.

Living leaves of species of *Gayophytum.* Soda Springs, California. *Jones.* Northern California. Aug. *Pringle.*

PERIDERMIUM FILAMENTOSUM.—Peridia numerous, irregularly arranged, erumpent, three or four lines long, one or two lines broad, cylindrical or subcompressed, obtuse at the apex, membranous, whitish when evacuated, containing a central bundle of loose percurrent concolorous longitudinal filaments which are attached to the inner surface at the apex; spores varying from subglobose or broadly elliptical to oblong-ovate or oblong-elliptical, yellow-orange, .0011–.0013 of an inch long, .00064–.0008 broad, epispore thick, minutely roughened.

Living branches of *Pinus ponderosa.* Arizona. July. *Pringle.*

This is a very interesting species. Its peculiarity is found in the central longitudinal filaments which extend through the mass of spores from the base to the apex of the peridium. The surface of these filaments is covered with minute protuberances which appear when magnified as if they might be immature spores. In the specimens before me none of the peridia are open at the apex, and in this respect also a remarkable departure is made from the generic character. The peridia in some of the specimens are longitudinally ruptured, thus indicating a relationship to the genus *Rœstelia.*

They are generally terete but sometimes a little flattened or compressed. The central filaments tend to hold the spores in mass so that they do not fall away as readily as in other species, and their attachment to the apex of the peridium appears to interfere with its rupturing at that point. Two other species, viz: *Peridium Pini* Lev. and *Peridium Harknessii* Moore, have been reported as inhabitants of *Pinus ponderosa*.

Dothidea Dasylirii.—Stroma amphigenous, small, narrowly elliptical, oblong or linear, black, for a long time covered by the epidermis which is at length ruptured longitudinally; cells few, white within; asci oblong or subcylindrical; spores crowded or biseriate, oblong, often a little broader toward one end, colorless, .0012–.0017 of an inch long, .00065–.00075 broad.

Leaves of some species of *Dasylirion*, probably *D. Wheeleri*. Arizona. May. *Pringle.*

Dothidea Pringlei.—Stroma irregular in shape, variable in size, two to twelve lines long, penetrating the matrix deeply, amphigenous, black, surface uneven, coarsely papillose by the scattered slightly prominent ostiola, cells unequal, deeply seated; asci cylindrical; spores oblong-elliptical, smooth, uniseriate, colored, .0012–.0016 of an inch long, .0008 broad, often containing two or more nuclei.

Living and languishing leaves of *Yucca macrocarpa*. Arizona. May. *Pringle.*

Sometimes the surface of the stroma is shining, but usually it is opaque.

Trichospora aridophila.—Perithecia minute, .01–.012 of an inch in diameter, scattered, hemispherical or depressed, black, ostiolum minute, papilliform; asci subcylindrical, .0045–.0048 of an inch long, .0011–.0012 broad; spores crowded or biseriate, oblong or obovate, slightly constricted in the middle, muriform, colored, .0011–.0014 of an inch long, .0005–.0006 broad.

Bleached surface of dry wood. Arizona. May. *Pringle.*

This species is closely related to *T. obducens*, but differs so much in habit, that it seems best to separate it.

Selenia aurea.—Growing with the normal form of this species, having *golden yellow* petals, is a variety with the petals pale canary yellow.

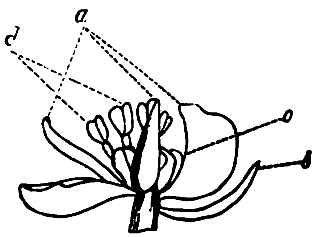
This species has fragrant flowers. The pleasant oder is wafted with the wind to a considerable distance from a large patch.

The golden yellow of the petals is so intense that it is painful to the eyes to look for any length of time at a large patch in the bright sunshine.

The flowers are so conspicuous they would make a striking appearance in a flower garden planted in bunches.—F. L. Harvey.

Notes on Ranunculus.—While examining some specimens

of *R. abortivus*, var. *micranthus*, my attention was called to a singular structure in a head of carpels and occupying the normal position of an achenium. Upon examination it proved to be a flower of the following structure. The flower was raised on a short peduncle and subtended by a bract (b). The calyx (a) was very irregular, no two of the *four* sepals being of the same shape. The corolla was obsolete. The stamens (d), eight in number, were nearly normal though in some the filament and anther seemed to blend. There were about ten carpels (c) of normal shape excepting the beak was somewhat elongated. The accompanying figure shows the relation



of the parts, but is greatly magnified, the flower really being no longer than one of the carpels. The stamens and petals of the flower, in the head of which this structure occurred, had fallen.

This variety of *R. abortivus* in this region has the carpels in an elongated head, the length being often twice the diameter.

There is another variety of this species (var. *grandiflora*) which grows upon cliffs high above the valleys, in which the petals far exceed the sepals in length, and the flower expands half an inch.

Ranunculus fascicularis, Muhl., has in this region entire root-leaves and beginners *invariably* place it along with *R. rhomboideus*, if they use Gray's Manual, as this "root leaves are not divided to the very base." Is it unusual for this plant to have entire root-leaves, or is there some defect in the key?—F. L. HARVEY, *Fayetteville, Ark.*

A Synopsis of the North American Lichens:* Part I, comprising the Parmeliacei, Cladoniei, and Cœnogoniei; by Edward Tuckerman, M. A.; Boston, S. E. Cassino, 1882.—This book is exactly what is needed to give an impetus to the study of Lichens. Heretofore very few botanists have been attracted to their study from the great lack of convenient literature, but one can hardly turn over the handsomely printed pages of this little octavo volume without feeling a desire to cultivate a field that has so long been neglected. If ever the proverbial "felt want" was a real one it was in this case: and has been supplied by the only person really able to publish an authoritative work of this kind. In this book of some 260 pages the author has described the species of one tribe, the *Parmeliacei*, containing nearly 40 genera, and two families under the tribe *Lecideacei*, namely, *Cladonei* and *Cœnogoniei*; both of which add but four genera. These comprise the more conspicuous lichens, just those to which students are first attracted. In view of the

*The above notice was prepared for the April GAZETTE, but by mistake was omitted.

unsettled condition of this group of plants it must be exceedingly difficult for a philosophical mind to feel satisfied in their study, and this is apparently exactly Prof. Tuckerman's position. The ordinary multiplier of species would meet with no difficulty, but would reap a rich harvest among the bewildering display of forms; but our author has no such thought and with evident reluctance sends out the present book with its species, "in great part, sufficiently well settled." All through the work one finds new things described, but not as yet admitted to specific rank, and having only provisional places. These, we are told, the author would have preferred to keep back, "with Horace, *nonum in annum*." We are thankful however that he did not in this case follow literally the precepts of the genial poet, for this work will enable more of us to help the author in fixing the uncertain forms. There is usually no loss in putting out a tentative work, for observers are never so provoked into reporting their observations as when they think they are correcting blunders. Our author also thinks that Lichenology has not kept pace with the "diagnostic enumeration of new forms called arbitrarily species;" which same may be said of some other groups of plants. As students of Phænogamic Botany are in the habit of looking to Robert Brown as the most philosophical observer, so the students of Lichens look with equal veneration upon Elias Fries.

In some 20 pages of introduction Prof. Tuckerman gives a capital view of the present status of our knowledge concerning lichens. This is followed by a list of recent authors and a key to the 72 genera, grouped under the two series, *Gymnocarpi*, and *Angiocarpi*, names that remind us of our series of Dicotyledons. Then follows the body of the work, containing quite a full description of characters, localities, and relations of the species. Our copy happened to be faulty, lacking pages 257–260 and thus depriving us of two or three small genera; nor could we find *Thamnolia* in the index, although it appears in the body of the work.

Nearly 500 species are described, the largest genus being *Lecanora*, numbering 56 species. The other large genera are *Cladonia* with 35 species, *Parmelia* 30, *Placodium* 28, *Collema* 27, *Leptogium* 25, *Pannaria* 24, *Cetraria* 22, and *Physcia* and *Sticta* each 21. This shows remarkable uniformity in the size of the genera; but in the other genera the number of species drops very rapidly into the single digits.

It is to be hoped and expected that one of the results of this book will be the more earnest study of this puzzling group of plants, which very fact will hasten the reading of many riddles. There is no reason now why Lichens should not have as many devotees as most other groups of Cryptogamia.—J. M. C.

Action of Acids on Cellulose.—"Acids (especially sulphuric acid) *when greatly diluted** cause starch grains and cellulose at the

*Italics mine. L. S.

ordinary temperature to swell up much more violently than pure water, without however destroying their organization."—Sachs' Text-book of Botany, Bennett & Dyers' Trans., p. 592.

Accompanying the above statement, Sachs gives a figure of the bast-fibers from the leaf of *Hoya carnosa* as they appear after treatment with suphuric acid and iodine. All my attempts to obtain these appearances with "greatly diluted" sulphuric acid having failed, I repeated the experiment using acid (C. P.) of known strength. No perceptible effect was produced by the application to different specimens ofdilutions containing 20, 30, 40 or 50 per cent. of acid. Sixty per cent. acid however produced the extraordinary swelling as figured by Sachs. Similar experiments were tried with the bast-fibers from the leaves of *Yucca aloifolia* and *Latonia Borbonica* with similar results. It seems to me that 60 p. c. acid can hardly be said to be "greatly diluted."

Can any one explain the discrepancy?—LIZZIE SHOEMAKER, *Botanical Laboratory, Purdue University, LaFayette, Ind.*

A Bit of Fern History.—In reviewing the history of some of our rare ferns during the past ten years, it is interesting to note the changes which have occurred in their comparative scarcity and abundance.

Ten years ago *Botrychium simplex* was so great a rarity that one might almost despair of ever obtaining a specimen; now it is plentiful enough, obtainable with little or no difficulty, and seldom called for in exchange. In Massachusetts it had not been collected for many years, when E. S. Wheeler detected it in Berlin, in 1878. Since then it has only been recorded twice—both times from Essex Co.—and is still rare in the State where it was originally discovered by Rev. Edward Hitchcock, in 1822. When E. S. Miller found it on Long Island, N. Y., in 1873, those who were able to secure specimens from him, regarded themselves as fortunate indeed. But in 1877 Mrs. Chas. Barnes, of Syracuse, found it so plentiful in the North Woods that she was able to supply many demands for it, while in the same year Mr. Pringle found it equally plentiful in Vermont. Since then it has continued to turn up at intervals in different localities from Maine to California, until probably no one who has made any effort to make up a collection of North American Ferns is without a specimen.

The writer recalls the pleasurable emotions with which he first received imperfect specimens of *Asplenium myriophyllum* and *Cheilanthes Lindheimeri*, at that time desiderata so rare as seemingly to be placed beyond reach. The first of these was received from Dr. Chapman himself—the specimen being the last of the original collection made by him twenty years before, a fact which enhanced its value greatly—and the writer still remembers how eagerly some friends received, and how much they prized the precious bits which he ventured to detach from his specimen to share with them. But

since its re-discovery by Mr. Shockley in 1878, the collections of J. Donnell Smith, Miss Reynolds and A. H. Curtiss have left no excuse for anyone's being without a specimen.

Cheilanthes Lindheimeri has also been placed within the reach of all through the recent collections of H. H. Rusby, C. G. Pringle and others, who have found it plentiful in New Mexico and Arizona —it being especially abundant along the foot-hills in the mountain ranges of the south-eastern portion of the last named territory.

In making up a list of ferns considered rare, or difficult to obtain when the writer began his herbarium in 1873, the following may be given:

1. Acrostichum aureum.
2. Polypodium Plumula.
3. falcatum.
4. Scouleri.
5. Phyllitis.
6. Gymnogramme hispida. (Then the *G. pedata* of our check lists.)
7. Notholæna sinuata.
8. ferruginea.
9. candida.
10. dealbata.
11. Newberryi.
12. Hookeri. (Then *N. cretacea*).
13. Fendleri.
14. Cheilanthes Californica.
15. Wrightii
16. microphylla.
17. Alabamensis.
18. tomentosa.
19. Eatoni.
20. myriophylla.?
21. Lindheimeri.
22. argentea. (Doubtfully admitted).
23. Cryptogramme acrostichoides.
24. Pellœa Breweri.
25. Bridgesii.
26. aspera.(Then *Cheilanthes aspera*).
27. ternifolia.
28. Wrightii.
29. flexuosa.
30. pulchella.
31. densa.
32. Pteris longifolia.
33. Cretica.
34. Adiantum tricholepis. (The *A. pilosum* of that date).
35. Blechnum serrulatum.
36. Lomaria spicant.
37. Asplenium pinnatifidum.
38. ebenoides.
39. parvulum.
40. viride.
41. dentatum.
42. Bradleyi.
43. septentrionale.
44. myriophyllum.
45. Phegopteris alpestris.
46. Aspidium Lonchitis.
47. fragrans.
48. juglandifolium.
49. Cystopteris montana.
50. Woodsia hyperborea.
51. glabella
52. scopulina.
53. Oregana.
54. Nephrolepis exaltata.
55. Trichomanes Petersii.
56. Schizœa pusilla.
57. Aneimia Mexicana.
58. adiantifolia.
59. Botrychium simplex.
60. Lunaria.
61. boreale.
62. Ophioglossum nudicaule.
63. crotalophoroides. (Then *O. bulbosum*).

During the succeeding five years very little or no decided change took place in the status of any of these species, while at the close of that period the list might have been increased by the addition of the following:

64. Polypodium pectinatum.
65. Notholæna Parryi.
66. tenera.
67. Cheilanthes leucopoda.
68. Clevelandii.
69. Cooperæ.
70. Pteris serrulata.
71. Adiantum tenerum.
72. Asplenium firmum.
73. cicutarium.
74. Aspidium unitum.
75. Ophioglossum palmatum.

Here we have 75 species which might have been considered rare at the beginning of 1878, more than one half of the whole number of species then known. It will be observed, however, that the greater number of these species were southern—mostly in the gulf-states—and south-western, extending through the territories into California, with only an occasional species in the north, and one might have inferred from this that, for most part, they were rare only because of the partial explorations in those regions.

Subsequently a marked change began. The growing interest in fern pursuits, stimulated by the inspiriting work on our North American Ferns by Prof. Eaton—to whom we are all under such deep obligations, and who is justly to be regarded as the founder of systematic American Pteridology—led to many nearly simultaneous efforts on the part of numerous collectors which resulted in making a large percentage of our rare ferns common, others more readily obtainable. and adding other species to our national flora.

In 1877–78 the lamented Dr. Garber was in Florida, making finer specimens of Florida ferns than had been seen before, and bringing to light many hidden treasures. The re-discovery of *Asplenium dentatum*, *Pteris longifolia*, and the discovery of *Asplenium serratum* and *Ceratopteris thalictroides* in that state will always be associated with his ever to be remembered name.

The veteran Chapman, who in his old age seemed to have quaffed an invigorating draught from that "Fountain," for which Ponce de Leon sought so long in vain, not to be outdone, had signaled the renewal of his activity, and shed new lustre on his honored name by the fine discovery of *Ophioglossum palmatum* in 1875; and now, the discovery of *Asplenium cicutarium* by Capt. C. F. Adams, the re-discovery of *Asplenium myriophyllum* and *Pteris Cretica* by Mr. Shockley, was followed by the fine collections of J. Donnell Smith, and his splendid discovery of *Aspidium conterminum*.

Latterly that indefatigable botanical collector, A. H. Curtiss, has been vigorously pushing his explorations of the southern coast region of Florida out on to the Florida Keys with excellent results, supplying prominent herbaria with his fine complete specimens and adding *Cheilanthes microphylla*, *Aspidium trifoliatum*, *Tænitis lanceolata* and *Polypodium Swartzii* to the flora of that state—the two, and at the time of collection, the three last of these being new to the United States as well.

The discovery of *Asplenium viride*, *Woodsia hyperborea* and *Botrychium simplex* in Vermont by C. G. Pringle; of *Botrychium Lunaria* in Connecticut by Oscar Harger and Dr. F. W. Hall; of *Asplenium ebenoides* in the same state by J. S. Adam, and in New York state by Clarence Lown; the unexpected discovery of *Scolopendrium vulgare* in Tennessee by Mr. Cheathem, as recorded by John Williamson; the re-discovery of *Botrychium boreale*—doubly interesting as a verification of Milde's re-

corded station for it—,with the original discovery of *Aspidium Oreopteris* in Unalaska by L. M. Turner; of *Aspidium Mohrioides* in California by J. G. Lemmon; of *Cystopteris montana*, *Aspidium Lonchitis* and *Botrychium Lunaria* in Colorado by T. S. Brandegee; of *Notholæna Grayi* in Arizona by W. M. Courtis; of *Notholæna Lemmoni* and *N. nivea* in the same territory by Lemmon; *Cheilanthes Parishii* in California by the Parish Bros.; the re-discovery of *Pellæa aspera* in Texas by Dr. Edward Palmer, with many other interesting discoveries which have been recorded from time to time, marked this period, while recent collectors have so changed the status of the southern and southwestern ferns that our previous lists may now be reduced to the following, which will be interesting for comparisons five or ten years hence:

1. Notholæna ferruginea.
2. tenera.
3. Cheilanthes leucopoda.
4. microphylla.
5. myriophylla.? (As understood by the writer)
6. argentea. (Its actual presence yet to be verified).
7. Pellœa Breweri.
8. Bridgesii.
9. aspera.
10. pulchella.
11. ternifolia.
12. flexuosa.
13. Pteris serrulata.
14. longifolia.
15. Adiantum tricholepis.
16. Asplenium ebenoides,
17. dentatum.
18. Bradleyi.
19. septentrionale.
20. cicutarium.
21. Phegopteris alpestris.
22. Aspidium Lonchitis.
23. fragrans.
24. juglandifolium.
25. Cystopteris montana.
26. Woodsia hyperborea.
27. glabella.
28. Trichomanes Petersii.
29. Schizœa pusilla.
30. Aneimia Mexicana.
31. adiantifolia.
32. Botrychium boreale.
33. Ophioglossum nudicaule.
34. crotalophoroides.
35. palmatum.

Here we have a reduction of more than one half from the list as given before, but to these may be added the more recent discoveries of

36. Polypodium Swartzii.
37. Notholæna nivea.
38. Grayi—plentiful enough in Arizona, but not fairly in distribution.
39. Lemmoni— " " " " " " " " "
40. Cheilanthes Parishii.
41. Asplenium serratum.
42. Tænitis lanceolata.
43. Aspidium trifoliatum.
44. Oreopteris.
45. conterminum.
46. Woodsia Mexicana.
47. Ceratopteris thalictroides.

making a total number of 47 species which may be regarded as rare ferns or which are not easily obtained at the present time. The experience already recorded, however, justifies the belief that many of these will be found plentiful enough when the regions where they grow are more thoroughly explored, while the increasing railroad facilities and communications are opening to the botan-

ist vast regions before almost inaccessible and holding out promises of many further additions to our fern flora.

There are, however, seemingly a few ferns that remain rare, even in well explored regions, and others so local, that, although they may be obtained without much difficulty, they must still be regarded as rare ferns on account of their restricted local distribu tion. Of the former class *Asplenium ebenoides* may be cited as an example, and of the latter *Schizœa pusilla*, which is wholly restricted as far as now known to a very limited area in New Jersey and the single station recently discovered in Nova Scotia by Miss Knight. No where else has this little fern been found, and although it is apparently quite plentiful, its limited area should teach moderation in collecting it, lest in time it become wholly eradicated and lost.—GEO. E. DAVENPORT, *Medford, Mass.*

SUB.-NOTE.—An instance of the unexpected manner in which rare ferns occasionally turn up occurs in the recent discovery or rediscovery ot *Ophioglossum nudicaule* in San Diego, California, by Dr. C. C. Parry.

Dr. Parry found this fern in San Diego as long ago as 1850, while connected with the Mexican Boundary Survey, but it was not identified at that time, and losing his specimens while crossing the Isthmus he has never been able to verify his discovery until now. I have received specimens from Dr. Parry and also from Daniel Cleveland, Esq., who was with him at the time of his interesting re-discovery of the plant in March last.—G. E. D.

Pholisma arenarium, Nutt.—The statement is made in the Botany of California (vol. I. p. 464) that this plant grows in "sandy soil and at the base of hills, near Monterey and San Diego, Douglas, Nuttall, &c. Parasitic on the roots of oaks?"

I have been unable to learn that any specimens of this plant were collected by any one but Nuttall, and at San Diego, in 1835–6, until it was re-collected by me in 1875. The fruit is known only from my specimens. This plant is parasitic on the roots of *Eriodyction tomentosum*, and not upon the roots ot Oaks. It grows in sandy spots, in groups of from twenty-five to fifty, or more.—D. CLEVELAND, *San Diego, California.*

Jasminum odoratissimum.—One of my college students, Mr. E. W. Shedd, of the Sophomore class of Brown University, was at work the other day in describing by schedule a branch of *Jasminum odoratissimum*. He called my attention to a peculiarity of the corolla. It will be remembered that this is salverform, with five spreading lobes. In the plant under examination, which is before me as I write, two of the lobes of all the flowers differ from the rest in their calceolate form. These two lobes are the opposed ones, though there is an evident tendency in all to become slipperform. I do not observe any accompanying alteration ot the essential organs. I find the college students very quick to observe any deviations from a normal condition.—W. W. BAILEY, *Brown University.*

Botanical Gazette.

Vol. VII. JUNE, 1882. No. 6.

Editorial.—THE OLDEST HERBARIUM on record has been found in the form of garlands of dried flowers recently discovered on the breasts of mummies. The flowers are so well preserved that the colors of the petals and the color of the leaves are almost perfect.

MR. J. G. LEMMON and wife are off again for Arizona. One would have supposed that the experience of their last trip would have sufficed for a lifetime; but as long as a plant remains to be discoved, these intrepid explorers will try to find it.

PROF. F. L. HARVEY, of Fayetteville, Ark., writes that the peach trees in that region this spring are producing a great many multiple carpels. In some trees nearly all the flowers have formed multiple fruits, varying from doublets to quadruplets. The freak does not appear to be local, but notices of it are to be seen in the state papers. The trees have not borne for two years and it seems like an effort to make up for lost time.

MISS M. B. FLINT, of Brookhaven. Miss.. reports finding, April 27th, a full-grown leaf of *Catalpa speciosa* with two midribs. The leaf was of normal shape at base, but above it forked, forming two tips, each one of them slenderly acuminate. If the midribs had been superimposed the leaf would have been the typical form. The growth was on a young seedling and was the only monstrosity the plant showed.

PROF. A. B. SEYMOUR of Ills. Univ.. Champaign, writes that near the last of April he found *Ophioglossum vulgatum*, L., growing in wooded bottom lands near the Pine Hills in the most northwest part of Union Co., Ills. Only a single plant has been previously reported in Illinois and that was found in Wabash Co. Professor Seymour counted near fifty plants and there were probably more.

IT APPEARS THAT the genus *Chara* is not all plain sailing. It contains such an inextricable tangle of forms that it is hard to draw lines of classification. In the *American Naturalist* for May, Dr. T. F. Allen describes and figures 9 American "forms" of *C. coronata*. which he does not pretend can be called varieties. It is to be hoped that this devoted student will bring order out of chaos so that others may have the courage to enter the field.

THE TORREY BULLETIN for April is an unusually full number,

containing quite an elaborate paper on the "Development of the Cortex in Chara" by our chief authority on that group of plants, Dr. T. F. Allen. This paper is accompanied by 8 plates. Another plate illustrates Mr. Joseph Schrenk's note on the "Development of the Root-stock of Dicentra cucullaria." Other notes by Prof. D. C. Eaton, W. W. Bailey, F. Lamson Scribner, Thomas Meehan and others complete the contents of this very interesting number.

ROBERT CLARK & Co., of Cincinnati, propose to publish a periodical to be called "The American Journal of Forestry," as a practical outgrowth of the Forestry Convention recently held in that city. The object is a splendid one, but it appears to us that the majority of the names of the proposed contributors are names much more distinguished in departments having nothing to do with Forestry, just as was the case with the convention referred to. The list contains some splendid names, but many of them are more pretentious than of any actual value.

TOO MUCH CARE can not be given to the careful writing and proof reading of scientific articles. There should the same exactness be demanded in this regard as in the statement of facts. The errors which now creep into our most careful journals are the results either of careless writing or careless proof-reading. Authors can greatly diminish the percentage of errors by writing with perfect plainness, always going on the supposition that the printer is absolutely ignorant of every word and correctness depends upon the distinct formation of every letter. There was a time when all carelessly written manuscripts were copied in this office, but that time has long since past, and authors usually have no one to blame but themselves when mistakes occur in their articles. We are glad to learn that measures are about to be taken by leading naturalists to correct this in the more formal papers submitted for publication, by a more careful examination of them, both in manuscript and proof.

MR. LESTER F. WARD has published a "Guide to the Flora of Washington and Vicinity" as the 26th Bulletin of the U. S. National Museum. It forms a pamphlet of 264 pages, with a large map, and is a most exhaustive affair. It is really an elaboration of an outline presented to the Philosophical Society of Washington last year, and noticed before in these pages. Many useful hints can here be obtained by those preparing local catalogues. Not the least valuable part of the work is the Appendix, in which full directions are given to beginners in the matter of collecting, preserving, arranging, exchanging, etc. The advice in these respects is unusually sensible, and worth following. Ordinarily, the best plan for the beginner is not to read such advice until he has developed his own methods and then he does not need it. It is often as impracticable as it well can be, and there are almost as many ways of collecting, preserving, etc., as there are botanists, and most of them answer the pur-

pose very well. Mr. Ward's advice, however, will not encumber the most precise disposition. The writer must confess that he has about the same feeling in regard to this whole subject as he has expressed in the matter of microscopes. An herbarium, like a microscope, should not be an end, but simply a means to an end, and when it ceases to be that, it becomes a mere toy, like a collection of postage stamps or crockery. It is to be feared that the craze for collecting has infected too many of our botanists whose whole enjoyment of their plants is the miser's enjoyment of his gold. All the collecting that is being done in this country should yield us richer returns of information. Every herbarium, however small, should be a perennial fountain and not a stagnant pool. Mr. Ward enforces well the real object of an herbarium, but that part of his advice will be less heeded than the mechanical part.

The Leaves of Aquatic Plants.—The leaves of aquatic plants may be divided into 3 classes; aerial, floating and immersed. The first class has stomata on both sides of the leaf; the second, on the upper side only; and the last class has none at all. In the first two, the air can be taken through the stomata directly into the leaf; in the last class, the necessary gases not existing as a body (of air) in the water, there is no use for stomata, which would take up water as well as air. So we have breathing holes in the leaves disconnected from direct contact with water and into which carbon dioxide is absorbed for the use of the plant (BOT. GAZ., Vol. VI. No. 8). These are the well-known intercellular spaces. So we see that it is a natural division.

To the first class belong the leaves of the subaquatic or marsh plants, which root in the water and send their branches into the air, as in *Nasturtium officinale*.

To the next belong the leaves of *Nymphæaceæ*, *Limnanthemum*, *Orontium* and *Marsilea*, raised by petioles to the water surface, also those of *Schollera* and *Callitrichaceæ* (aquatic forms) raised by stems to the same level. The peduncles of some water flowers are also elongated to get to the air.

To the last class belong some *Isoetes*, *Potamogetons*, *Vallisneria*, *Ranunculus divaricatus*, and most *Utriculariæ*.

Some plants combine the second and last classes, having both floating and immersed leaves (some species of *Potamogeton*).

Some, the first and last classes, have both aerial and immersed leaves, as *Nasturtium lacustre* and *Myriophyllum*.

A few plants having stomata (first class), beginning their existence in the water, emerge as the latter dries up.

Plants of the second class, disconnected from the land and often very small, are sometimes matted to keep the stomata-bearing surface upward. This is effected in *Azolla* by its branching habit, in

Wolffia and *Lemna* by the coherence for a time of the proliferous parent to its offspring. The yielding to currents of water is a matter of indifference, unless it be to carry the plant into new food regions, which is certainly not well accomplished in some ponds. The disconnection with the soil keeps the stomata above water in the ever changing level of ponds. This is a matter of prime importance to leaves of the second class. A root that would bind our *Wolffia* to the soil would take many times the material of the plant itself. The same thing is effected in others of this class by long petioles and stems which being pliable allow the leaves to float on the water, for if attached stiffly to the stem the running stream would tilt the leaf towards its downward course, and by being longer than absolutely necessary, it allows the leaf to surmount the rise of a stream as well as to follow it in its fall. The same remarks apply to the pliability of stems which having immersed leaves must still effect the elevation of their supplementary floating (*Potamogeton*) or aerial (*Nasturtium lacustre*) leaves, which would otherwise not perform their functions. Floating leaves are generally entire and simple in form to aid their floating; this is supplemented in *Nymphæa regia* by the raised border of the leaf.

Immersed leaves are long and linear (*Potamogeton*, *Vallisneria*) or divided into coarse or capillary segments. These leaves must remain in the water, since out of it they cannot live and also have no stomata to breathe with. So we find arrangements to keep them in the water as long as there is any; the leaves are flaccid or the stem may be weak, and so they rise and fall with the height of the water (some immersed *Potamogetons* and *Vallisneria*.) The two cases are often correlated in capillary leaves. *Utricularia* and *Ranunculus aquatilis*, var. *trichophyllus*). while in other specimens these leaves may be stiff, depending on the flexible stem entirely (*Nasturtium lacustre* and *Ranunculus aquatilis*, var. *stagnatilis*). Since these plants breathe in the water and the amount of surface exposed is an item for them, we find capillary division abounding among immersed leaves. But while aerial leaves have strong fibers to spread out the leaf to the best possible advantage this is effected in water plants by large air holes in the leaf; this may explain their flaccidness also.

Plants having stomata supplemented by large air tubes may lead a double existence, living first in water, and later on the dried-up bottoms of pond or stream as in *Isoetes* and perhaps *Vallisneria septangulare*, *Elatine*, &c. Is not this principle of the uses of leaves a more complete key to these facts than that of changing currents?

(See in this connection "Designs of some leaf-forms" in the March No. of the *Torrey Bulletin*.)—AUG. F. FOERSTE, *Dayton, O.*

Recently Introduced Plants in and about Rockford, Ill.—The rapidity with which our thriving western cities run through

the earlier stages of their growth, the quick transition from the informality of the fontier village to the stiff and pretentious urban airs of the prosperous manufacturing and trading town, is not more remarkable than the complete change which takes place in the vegetation covering the vacant lots, rubbish heaps and waste places of these communities. I remember well, for instance, how here in Rockford, Ill., say twenty years ago, the indigenous plants of the prairie and oak-opening sprang up on every side in close proximity to the beaten paths of busy men. The industrious young botanist, collecting for exchange, found his only limitations in the quantity of driers he possessed, and the amount of time, energy and discretion he could bring to the work of using them well. Now we must go miles out into the country for material and count ourselves fortunate, even then, if the little vestige of the native flora which last season afforded us a dozen desirable specimens has not since been swept away by the plow; while in the central portion of the city scarcely a single native species remains to dispute possession with street weeds, mostly of European descent and training.

Lactuca scariola, L., which has spread rapidly over the country along the line of railroads, was limited, with us, for a few years, to a single patch on the embankment east of the station-house, but has now been carried all over the city and out into the country even, by mud containing seeds adhering to carriage wheels. It threatens to become a troublesome weed, especially in gravel walks.

Amarantus blitoides, Watson, also brought in by the railroad (but from the west instead of the east), is just gaining a foothold. It takes kindly to sandy, sunny slopes, and spreads over the ground in dense, lusty patches very like Purslane.

The particular occasion for this note, however, is to record—for the first time I believe—the introduction of *Chenopodium Berlandieri*, Moq., in the states east ot the Mississippi and north of the Ohio. This is found, not in patches here and there, but scattered everywhere over vacant lots, under walls and along residence streets, keeping company with *Chenopodium glaucum*, *Artemisia biennis* and the omnipresent *Atriplex*; but unlike the nearly allied *C. album*, showing no tendency to intrude as a weed in cultivated grounds. A rather delicate species—for a pigweed—rarely exceeding 18 inches in height, diffusely branched and usually (when not crowded) declining. From its general diffusion the inference is plain that the importation took place years ago, and it seems very strange that a plant showing such complete adaptation to the environment (it is as much at home in town as *C. urbicum* itself) should not have been reported elsewhere. I am at a loss, indeed, to frame any conjecture as to how it got here—for instance, by seeds in mud sticking to the feet of Texas cattle—which does not involve the puzzling question, then why not all along between St. Louis and Chicago as well? I may as well mention, in conclusion, the fact that in some most unaccountable way, *Kochia scoparia*, Schrad., has been turned loose in

our streets and from its chenopodiaceous character, abundant seeding andthe tenacity with which it holds its own in a fair stand-up fight with the street weeds,bids fair to become thoroughly established. One back street near the gas works, where it grew most abundantly, was regraded last winter, and if the coming summer shows that instead of being destroyed it has only been scattered, I think we may fairly count it in as having come to stay. The plant is as symmetrical in habit, when not crowded, as a young Juniper; the foliage at a distance appears soft and graceful (more so than would be imagined by those who have seen only herbarium specimens), and, above all, presents a light yellowish green color which contrasts prettily with the darker bluish green of its associates.—M. S. Bebb, Rockford, Ill.

Dichogamy of Umbelliferæ.—I am under obligations to Mr. Trelease for his kind correction of my mistake in calling *Umbelliferæ* proterogynous. It was caused by Gray's Manual, page 187: "the styles are protruded from the bud some time before the anthers develop," also by personal observations of *Erigenia bulbosa*, Nutt., the only plant of this order which had been investigated by myself previously to *Pastinaca*. This I consider an unmistakable case of pro terogyny. The styles protrude from the just unfolding petals for the length of 1 mm. and have an angular divergence of 1-2 mm. At a later stage the stamens expand, the anthers successively dehisce, and during this period the styles approach each other so as to avoid self-fertilization apparently. Frequently this is not effected, and the styles remain expanded. But where they do close during this period they expand again as the stamens grow effete, gradually recurve, become effete themselves, turn reddish-brown and wither away. The stamens and petals drop off at the last expansion of the styles. The different flowers vary greatly, but this is the type development. Not to fall into any error I examined nearly 500 specimens. Therefore I consider our *Erigenia* to be a proterogynous plant, generally fertilized before the development of anthers, but capable of being fertilized by its own pollen, although this is apparently avoided in the first part of the second or polleniferous stage. The coming together of the styles is often indistinct and ineffectual. Plants left unfertilized can then be fertilized in the third stage by their own pollen or even by that of other plants still, since that would be more effective. But I believe that it does not take long for the styles to become effete and the carpels are apparently fructified before this stage in most cases. Although I have caught during the last 4 days 5 species of Diptera near these plants, I have never seen any at work, although I have looked at hundreds of plants in their native state during the last few days, but the days were stormy and cold. Still, from the presence of nectar in large quantities, I am willing to admit that there may be insects that frequent them. Finally, I am of the opinion (thanks to Mr. Trelease) that this plant (deviating from the family type)

originally proterandrous, became, from want of insects caused by its early appearance, autogamous by synanthesis, and is now again, by the adaptation to new insects, becoming dichogamous, but proterogynous, instead of proterandrous.—AUG. F. FOERSTE.

Mr. Foerste was kind enough to send with the above note dried specimens of *Erigenia*, from which it appears that self-fertilization is quite as probable as in *Hydrocotyle*, but although there is no question about the early elongation of the styles I could not be sure that the stigmas were receptive until dehiscence was nearly complete. From theoretical considerations, one might doubt the protogyny. The development of synacmy in a dichogamous species might readily follow a decrease in the number of visiting insects, but if their number afterward increased and dichogamy were again acquired, the hereditary direction of variation should tend to reproduce the same form of dichogamy that had originally been lost, and that still existed in related species and genera, especially in so uniform an order as the *Umbelliferæ*. Mr. Foerste writes that he has noticed a similar development of the stigmas in species of *Thaspium*. It is to be hoped that those who can obtain *Erigenia* will confirm this observation another season, while *Thaspium* can be examined this year. *Scandix Pecten-Veneris* should have been mentioned with *Hydrocotyle* in my note in the GAZETTE for March, as being self-fertile, possibly through incomplete dichogamy, its self-fertility being, as suggested by Mr. Henslow (Trans. Linn. Soc., 2 ser. Bot., 1, 365), correlated with the inconspicuousness of its flowers. *Apium* is also stated by Mr. Darwin (Cross and Self-Fert, 172) to be self-fertile.—WM. TRELEASE.

Notes from the Jour. Royal Micr. Soc., February—L. GUIGNARD finds that the embryo-sac of the Mimoseae (*Acacia retinoides* is taken as the type) is formed in the following manner: At the summit of the nucellus, beneath the epidermis, an axial cell, larger than the adjoining one, divides into two superposed cells, the apical and subapical. The subapical cell enlarges rapidly and becomes segmented horizontally into three superposed cells each equal in size to the mother-cell. Of these, the lowest, the true mother-cell of the embryo-sac, enlarges at the expense of the others and the lateral tissue of the nucellus. Resorption soon commences in the two superposed cells; the nuclei lose their sharp outline and soon disappear, together with the cell-walls; finally the whole substance of these cells is absorbed in the development of the lower mother-cell. This process is subject to variations, but it is always the lower cell which becomes the mother-cell and absorbs the others.

The same worker finds polyembryony not an uncommon phenomenon in the Mimoseæ, especially in *Schrankia uncinata*, in which it is allied with other abnormalities of structure.

E. WARTMANN finds that Spanish chestnuts germinate after an

exposure of nearly two hours to a cold of $-110°$, derived from a mixture of sulphuric ether and solid carbonic acid.

E. PRILLIEUX finds that the effect of warmth in the earth is to cause a hypertrophy of the interior of the stem in a young plant; when closely examined this is found to be accompanied by multiplication of the cell nuclei.

D. H. SCOTT, investigating the structure and development of laticiferous vessels, finds that they are developed from rows of cells, the transverse walls of which have been gradually absorbed, and, when two vessels lie side by side, the lateral walls also partially. The resorption usually takes place at an early period; in seedlings during the first stages of germination; in the secondary cortex shortly after the cells in question have separated from the cambium. The connection between distant laticiferous vessels is brought about in two ways; either by rows of cells that run transversely coalescing with each other, or by protuberances which unite in their growth, and which finally form canals similar to those of the *Conjugatæ*. Even before the first septa are absorbed, the cells are characterized by special contents, of which latex is probably a constituent.

A Curious Growth of Coreopsis.—Late in the summer of 1873 I observed a remarkable growth of *Coreopsis*, apparently *C. discoidea*, though the plants were so dwarfed and the floral organs so imperfectly developed that I name the species with much hesitancy.

In what is known as the "Big Woods," eight miles southwest of this place (Wheaton College, DuPage County, Illinois), there occur ponds or swamps, with no natural outlet, and bottoms of tenacious brick clay subsoil, several feet in thickness. These mud ponds or swamps are filled up by the winter and spring rains, but dry out in midsummer. The plants of which I am speaking grew *two feet above the ground* on the stems of Cephalanthus bushes, which were standing in one of those dried-out ponds. Long, slender roots (resembling the stems of Dodder), followed closely the fissures of the Cephalanthus bark down to the soil where they develop normally, thus connecting by a slender thread, as it were, the tuft of green herbage above with the moisture supplying earth below. The best developed plants were found highest up, though all were nearly on the same "horizon." Lower down I could see undeveloped seeds sticking to the bark, some of which had sprouted but failed to grow, apparently for want of moisture.

It seems most likely that the seeds floating on the surface of the water during a season of floods collected around the bushes; that the water remained standing until the time of their germination, and then began to slowly subside, and thus the roots following this retreating source of moisture-supply were led down to the ground.

The plants, as before stated, were very much dwarfed, 4 to 6

inches in height, but branching profusely, with stems varying in size from 1-16 to 1-4 inch in diameter. The roots exhibited little tendency to branch in the downward course, though in some intances dividing once or twice. If lateral fibers were developed they had mostly disappeared.—R. T. MORGAN, *Wheaton, DuPage County, Illinois.*

The Postage on Botanical Specimens.—In his new "*Flora of Washington*," Mr. Ward states that "the law forbids the sending of labels, of which any part is written, as third-class matter, and it is necessary to give each label a temporary number and put with the specimen a corresponding printed figure (cut out of a calendar) and to send the labels in a letter. * * * A very sensible decision was made by Postmaster-General Key that scientific labels, bills of lading, etc., if they contained nothing irrelevant, might pass with the specimens. This ruling has since been reversed as not in harmony with the spirit of the law." The writer adds that he "called personally at the Post-Office Department (Dec. 6, 1881), and was officially assured of the correctness of the statements herein made" (p. 234).

At the instance of some of my students, I applied by letter to the Department, April 25, 1882, for information as to the present ruling, receiving in reply a printed order, dated Feb. 21, 1331, signed by Postmaster-General Maynard. The part relating to botanical specimens reads as follows: "It is ordered that Section 232, Postal Regulations, be revoked, and in lieu thereof the following order is made: Mailable matter of the first-class shall embrace all matter wholly or partially in writing, except as herein provided. * * * The exceptions are as follows: * * * 7. Upon matter of the fourth-class the sender may write his own name and address preceded by the word 'from,' and also the number and names of the articles enclosed. He may also write upon or attach to any such articles, by tag or label, *a* mark *or* number, *name or* letter, for purpose of identification." The italicised words, not italicised in the order, were underscored in the copy sent to me. A knowledge of this fact may spare exchanging botanists some annoyance.—WM. TRELEASE, Madison, Wis.

Ferns of Iowa.—Miss MARY E. WOOD reports the following ferns collected by her on the Makoqueta River, about fifty miles west of Dubuque, Iowa:

Asplenium felix-fœmina, A. thelypteroides, A. angustifolium, Aspidium Goldianum, A. Thelypteris, Adiantum pedatum, Camptosorus rhizophyllus, Cystopteris bulbifera, C. fragilis, Onoclea sensibilis, Osmunda Claytoniana, Phegopteris hexagonoptera, Botrychium ternatum, Pellæa atropurpurea, P. gracilis, Pteris aquilina, Struthiopteris Germanica.

The Exogenous Flora of Lincoln Co., Mississippi, from October to May.—The subjoined list, though very far from exhaustive, is believed to be correct. The times of flowering may represent the somewhat abnormal conditions of the present year. Coming here, the last of September, after the prolonged drought of '81, many plants which should have been flowering were scorched to the ground. The first rain brought out a second bloom of many spring flowers. *Rosaceæ* were especially thus represented. In December, roses, *Viola odorata*, and most of the garden bulbs, *Narcissi* and Hyacinths, were blooming. The exceptionally warm and rainy winter has given place to a spring which old residents pronounce three weeks earlier than usual.

Some geological considerations may also so effect the Flora as to make it not altogether what one would expect in the Pine Barrens. Throughout this sandy region, running between the Pearl river and the first tier of counties east of the Mississippi, until lost in the Yazoo Hills, is a belt of stiff, red clay, with occasional out-croppings of the "Buckshot" soil of north-eastern Mississippi.—MARTHA B. FLINT, *Shelbyville, Kentucky.*

OCTOBER AND NOVEMBER.

Ascyrum stans, Michx.
var. obovatum.
Crux-Andreæ, L.
pumilum, Michx. April.
Hypericum Drummondii, T. & G.
Desmodium humifusum, Beck.
viridiflorum, Beck.
Lespedeza procumbens, Michx.
repens, T. & G.
angustifolia, Gr.
Stylosanthes elatior, Swartz.
Centrosema Virginianum, Benth.
Cassia occidentalis, L.
Chamæcrista, L.
nictitans, L.
var. asper.
Sida spinosa, L.
Abutilon Avicennæ, Gærtn.
Penthorum sedoides, L.
Circæa Lutetiana, L.
Œnothera biennis, L.
Diodia Virginica, L.
teres, Walt.
Vernonia fasciculata, Michx.
Eupatorium parviflorum, L.
perfoliatum, L.
serotinum, Michx.
aromaticum, L.
Mikania scandens, L.
Conoclinium cœlesti. um, L.
Aster sericeus, Vent.
concolor, L.
patens, Ait.
tenuifolius, L
Chrysopsis graminifolia, Nutt.
gossypina, Nutt.
villosa, Nutt.
Mariana, Nutt.
Pluchea fœtida, DC.
Ambrosia trifida, L.
artemisiæfolia, L.
Xanthium strumarium, L.
Rudbeckia laciniata, L.
hirta, L.
triloba, L.
Helianthus lætiflorus, Pers.
Bidens bipinnata, L.
frondosa, L.
Helenium tenuifolium. Nutt.
Verbascum Thapsus, L.
Blattaria, L.
Conobea multifida, Benth.
Gerardia purpurea, L.
var. fasciculata, Chap
Cichorium Intybus, L.
Lobelia glandulosa, Walt.
inflata, L.
puberula, Michx.
Ruellia ciliosa, Pursh.
Verbena angustifolia, Michx.
Teucrium Canadense, L.
Isanthus cœruleus, Michx.
Pycnanthemum Tullia, Benth
Hedeoma pulegioides, Pers.
Leonurus Cardiaca, L.
Leonotis nepetæfolia, Br.
Heliotropium Indicum, B. & H
Ipomœa Nil, Roth.

adnatus, Nutt.
squarrosus, Walt.
Erigeron Canadense, L.
Diplopappus linariifolius, Hook.
Solidago virgata, L.
rigida, L
elliptica, L.
tortifolia, Ell.
odora, Ait.
var. inodora.
radula, Nutt.
tenuifolia, Pursh.
Jacquemontia tamnifolia, Griseb.
Cuscuta compacta, Juss.
Physalis angulata, L.
Gentiana ochroleuca, Frœl.
Asclepias incarnata, L., var. pulchra.
Chenopodium Botrys, L.
ambrosioides, L.
var. anthelminticum.
Amarantus paniculatus, L.
retroflexus, L.
Croton capitatus, Michx.
Gelsemium sempervirens, Ait. (Feb.)

JANUARY.

Arabis Ludoviciana, Meyer.
Capsella Bursa-pastoris, Mœnch.
Lepidium Virginicum, L.
Stellaria media, Smith.
pubera, Michx.
Houstonia minima, Beck.
Osmanthus Americana, B. & H.

FEBRUARY.

Ranunculus fascicularis, Muhl.
alismæfolius, Geyer.
repens, L.
pusillus, Poir.
abortivus, L.
sceleratus, L.
Cardamine rhomboidea, DC.
hirsuta, L.
var. sylvatica.
Viola lanceolata, L.
primulæfolia, L.
cucullata, Ait.
var. cordata.
pedata, L.
var. bicolor.
Cerastium nutans, Raf.
Sagina decumbens, Gr.
Oxalis violacea, L.
stricta, L.
Acetosella, L. (rare)
Prunus Caroliniana, Ait.
Americana, Marshall.
Chicasa, Michx.
Amelanchier Canadensis, T. & G., var. [Botryapium.
Veronica serpyllifolia, L.
peregrina, L.
arvensis, L.
Plantago heterophylla, Nutt.
Houstonia cœrulea, L.
Cynthia Dandelion, DC.
Vaccinium tenellum, Ait.
Salvia lyrata, L.
var. obovata.
Brunella vulgaris, L.
Lamium amplexicaule, L.
Gelsemium sempervirens, Ait.
Dichondra repens, Forst.
var. Carolinensis, [Choisy.

MARCH.

Delphinium azureum, Michx.
Liriodendron Tulipifera, L.
Podophyllum peltatum, L.
Nasturtium officinale, L.
sessiliflorum, Nutt.
Polygala nana, DC.
Trifolium Carolinianum, Michx.
pratense, L.
procumbens, L.
Robinia Pseudacacia, L.
Wistaria frutescens, DC.
Desmodium rigidum, DC. (?)
Styrax grandiflora, Ait.
Potentilla Canadensis, L.
var. simplex.
Fragaria Indica, L.
Virginiana, Ehrhart.
Rubus villosus, Ait.
cuneifolius, Pursh.
Houstonia purpurea, L.
Erigeron Philadelphicum, L.
quercifolium, Lam.
Coreopsis grandiflora, Nutt.
Gnaphalium purpureum, L.
Antennaria plantaginifolia, Br.
Senecio lobatus, Pers.
aureus, L.
Cirsium horridulum, Michx.
Krigia Virginica, Willd.
var. dichotoma.
Caroliniana, Nutt.
Bignonia capreolata, L.
Sonchus asper, Vill.
oleraceus, L.
Gaylussacia dumosa, T. & G.
var. hirtella, Gr
Vaccinium arboreum, Marshall.
stamineum, L.

trivialis, Michx.
Rosa lævigata, Michx.
nitida, Willd.
Cratægus Pyracantha, Pers. (introduced)
apiifolia, Michx.
æstivalis, T. & G.
Pyrus angustifolia, Ait.
Itea Virginica, L.
Liquidambar styraciflua, L.
Œnothera sinuata, L.
var. humistrata, Gr.
linearis, Michx.
Cornus florida, L.
Nyssa multiflora, Wang.
Lonicera sempervirens, Ait.
grata, Ait.
Mitchella repens, L.
Rhododendron nudiflora, L.
Nepeta Glechoma, L.
Scutellaria parvula, Michx.
Phlox pilosa, L.
amœna, Sims.
Melia Azderach, L. (introduced.)
Chionanthus Virginica, L.
Asarum ariifolium, Michx.
Rumex crispus, L.
Morus rubra, L.
Quercus Phellos, L.
virens, L. (rare.)
aquatica, Catesby.
falcata, Michx.
nigra, L
Fagus ferruginea, Ait.
Ostrya Virginica, Willd.

Astragalus mollissimus, Torr.—A short time ago, my friend. Dr. Isaac Ott of Easton, Penn., received from a stock breeder in Western Kansas. a wild plant, know there by the name of "*loco*," and said to produce injurious and often fatal effects upon cattle and horses who eat it, causing paralysis and other functional disturbances. Dr. O., who is a skillful investigator of poisons and their action upon animal and vegetable organisms. fully confirms the reports of the herdsmen as to the deleterious properties of this plant. At my request, he procured for me specimens with flowers and full-grown pods, and it proved to be *Astragalus mollissimus*, Torr. From the quantity sent, its vigorous growth so early in the season, its strong, deep roots and its numerous, short, thick stems, it is fair to infer that it is at home and abounds in that region.—THOS. C. PORTER.

Equisetum variegatum, Schleich.—Mrs. A. E. Bush, of San Jose, Cal., has sent me specimens of an *Equisetum*, collected at the hills near that city, April 22, which must be referred to the above species. The stalks are densely tufted, and the grooves of the stem vary from 5 to 10, but are commonly 6 or 7; one large stalk had 11. This species is not mentioned in the "Botany of California" and to my knowledge has not been reported from this state hitherto. It appears in Colorado (*Porter* and *Coulter*), and from Ill. to N. H., and northward.—LUCIEN M. UNDERWOOD, *Wesl. Univ., Bloomington, Ill.*

Early Fungi.—I have received to-day from Southern Illinois, through Mr. F. S. Earle, fresh specimens of the following fungi: *Urocystis pompholigodes*, Schl., on *Ranunculus fascicularis*; *Cystopus candidus*, (Pers.) on *Capsella Bursa-pastoris* and *Peronospora nivea*, Ung., on *Geranium Carolinianum*. They are well developed and in good condition for study, and Mr. Earle tells me the *Cystopus* has been so all winter.—A. B. SEYMOUR, *University of Illinois, Champaign.*

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Editorial.—IN THE TORREY BULLETIN for June the editors continue their valuable list of the state and local floras of the United States. This is the third paper and is devoted to the south-eastern states, embracing Virginia, West Virginia, North Carolina, South Carolina, Georgia and Florida. Georgia seems to have been most poorly provided for, but a single local list having been made in the whole state.

PROF. A. B. SEYMOUR, in the last GAZETTE, was made responsible for a rather meaningless note. His note upon "Early Fungi" bore the date of March 5 in the manuscript, but no date appeared in print, thus making it lose all its force. We would suggest that our readers date the note referred to, that it may not be lost sight of.

MR. CHAS. E. SMITH, of Philadelphia, writes reporting a new station for *Corema Conradii*. He says: "I learned that *Corema Conradii* grew on Shawangunk Mountain, Ulster Co., N. Y., and as the plant has disappeared from two of the four localities formerly known (New Jersey and Long Island) I went there and got it. In the struggle for existence it appears to be getting the worst of it, and is dying out. On the second of May I found it in full bloom.

THE INDEX to the genus *Carex* omits *C. Porteri*, Olney, found by Prof. Porter in Maine; *C. glaucodea*, Tuck., found in New Jersey; and gives "*C. Fraseriana*, Sims, no synonym." Gray writes it *C. Fraseriana*, Sims; Chapman *C. Fraseri*, Sims; Boott in his *Carices* writes *C. Fraseri*, Andrews, syn. *C. Fraseriana*, Sims, and adds a note giving names and dates of publication to justify the name *Fraseri* and Andrews as the authority. For these corrections we are indebted to Mr. Chas. E. Smith.

MR. JOSEPH JACKSON, JR., of Millbury, Mass., is contributing to the *Worcester Daily Spy* some very interesting notes on the flora of that neighborhood. The subject is treated in a popular way which makes it interesting to the unscientific reader. The articles really furnish lists of the first appearance of the plants of that region, accompanied by appropriate remarks. As soon as 50 species have been enumerated they are published, thus making at the close of the season quite a complete catalogue.

PROF. V. CESATI, Director of the Botanic Garden at Naples, has offered for sale his large collection of plants. It consists of about 49,000 species, 32,000 being phanerogams, the whole containing over 350,000 specimens. The phanerogams are classified

according to DeCandolle's system, and are represented in many instances by original specimens. The collection is mounted on white paper and arranged in volumes. Prof. Cesati also offers for sale the autographs of 2,500 botanists. Persons desiring to obtain these collections, which contain plants from all over the world, should address Prof. Cesati before the end of August.

H. BAILLON has just published in Paris his *Monographie des Composees*. In Bentham and Hooker's *Genera Plantarum* this great order contains 780 genera, although the work of reduction was so rigidly performed that some genera were afterwards reinstated. Baillon has reduced the number of genera to 403, and in the sense that generic consolidation is a better fault than the opposite extreme this is commendable. Dr. Gray, for whose opinion in such matters we always look, says that even yet Baillon "keeps up several genera which we find it impossible to maintain; and there are others which should have been suppressed upon his principles, though not upon ours."

HUGO DEVRIES claims to have found the function of resinous matters in plants. That they were excrementitious has long since been given up, for their withdrawal from the plant proves to be an injury rather than a benefit. Hence they must be of some use to the plant, for in these days we do not believe so much that things were made for us as that we find in them and use what was made for themselves. DeVries thinks that in resin-producing plants the resinous juice is stored in the tree as a balm for wounds. Being stored up under tension it is immediately poured out over a wounded surface. No better dressing could be found than this rapidly oxidizing liquid, which excludes air and moisture and germs which induce decay.

THE UNIVERSITY of MINNESOTA will open a summer school during the coming season, beginning July 5th, to continue four weeks. The course in Botany will be conducted by Prof. J. C. Arthur, whose name and reputation are well known to readers of the GAZETTE. Laboratory work will be a prominent feature, and the subjects presented will be Morphology of the Vegetable Cell; Special Structure of Plants, considered by Classes; Vegetable Histology and Physiology; Bibliography and History of Botany. A personal acquaintance with Mr. Arthur in the laboratory gives the writer an opportunity to heartily recommend his work and methods to those desiring such instruction. He can be addressed at Charles City, Iowa, until July; after that at Minneapolis.

THE GARDENERS' MONTHLY for June is an unusually interesting number. Mr. Meehan is called upon to puncture a good deal of nonsense, and usually does so in a very sprightly way. In the number referred to, among other things, he noticed a curious paper read at the recent Forestry Convention held in Cincinnati, in which the writer suggested that the examination of cross-sections in a tree would show when the seasons in the past were dry seasons, and when wet ones—thin layers indicating the dry and broad ones the

wet. Mr. Meehan suggests that by taking sections at different places in the same log we would find the same layer bearing all kinds of testimony. The writer has heard classes gravely informed that the above was the fact, and also that the rings of growth found in fossil trees necessarily indicated seasons of cold and warmth. In the last instance a bright boy rather nonplussed the teacher by asking if there were no exogenous trees in the tropics.

PROF. F. C. PHILLIPS, of Western University, Penn., has been experimenting upon the effects produced upon plants by being grown in soil impregnated with certain metallic oxides. His conclusions are as follows:

1. That healthy plants, grown under favorable conditions, may absorb through their roots small quantities of lead, zinc, copper and arsenic.
2. That lead and zinc may enter the tissues in this way without causing any disturbance in the growth, nutrition and functions of the plant.
3. That the compounds of copper and arsenic exert a distinctly poisonous influence, tending, when present in larger quantity, to check the formation of roots, and either killing the plant or so far reducing its vitality as to interfere with nutrition and growth.

New Stations for Rare Plants.—1. *Botrychium matricariæfolium*, Al. Br. About June 10 of last summer, in company with Prof. Joseph Milliken of Columbus, O., I made an excursion for plants in the vicinity of this city. In a thicket on a northern slope, we found a specimen of this little fern. Going down on our hands and knees and making a thorough search, we finally counted *eighty-four* (84) specimens growing on an area of three or four square rods. This plant grows quite abundantly in eastern New York and in New England. But I have never before known it to be found west of the Alleghanies and south of Lake Superior. I have no doubt, though, that it grows on many a damp shady hill-side with a northern exposure, in the states of Indiana, Kentucky and Ohio. It should be looked for during the month of June.

2. *Veratrum Woodii*, Robbins. This plant grows in the woods about Dayton, O. My attention was first called to it by finding it transplanted from the woods to a neighbor's door-yard. The plants were very few and far between, however, till I found quite a patch of it near Ludlow Falls, 17 miles above Dayton, on the banks of the Stillwater river. In one spot I counted fifteen (15) plants ; the trouble was however that only four or five of them threw up flower stalks, so that I did not get many specimens.—A. P. MORGAN, *Cincinnati.*

The Exogenous Flora of Lincoln Co., Miss., From October to May. II.—In the brilliant procession of spring flowers come a few Asters and Golden Rods, heralds of the midsummer phalanx. Even the curious *Aster adnatus* is already in bud. Two things impress me as distinctive of the scenery and of the woodlands here.

There is very little of the freshness and the exuberance of vegetable growth which, farther north, characterize the time. There is, literally, no spring, no period of complete transition, no universal awakening into life. Plants doze through the mild winter and are quite undecided what to do, even when the equinox is past. The Star Anise and the Magnolias simultaneously bloom, unfold their new shoots and drop last year's leaves. The winter annuals are ripening their seeds and dying when, by the calendar, we should only expect young leaves and opening buds.

Another feature of the southern forests, noticeable even here, where the luxuriance of growth is much less than on the rich alluvial lands, is the great number of vines and showily blooming trees and shrubs. Over a muddy bayou hang the Cherry Laurel, the graceful *Euonymus*, the *Styrax* and the Farkle-berry with its delicate sprays of bloom, all interwoven with the wiry stems and profuse gold of the Yellow Jessamine, and hung with the tawny red trumpets of the Cross Vine. Or, later, beneath the Magnolias and Sweet Bays are thickets of gleaming *Hydrangea* and *Itea*, overrun with the scarlet Honeysuckles and the fragrant *Forsteronia*. In the herbaceous growth of the open barrens *Leguminosæ* are now greatly in preponderance, although I judge that in the advancing summer they will be displaced by the coarser *Compositæ*.

APRIL.

Magnolia grandiflora, L.
glauca, L.
acuminata, L.
Malva rotundifolia, L.
Modiola multifida, Mœnch.
Drosera brevifolia, Pursh.
Geranium Carolinanum, L.
Rhus copallina, L.
Toxicodendron, L.
var quercifolia.
var. radicans.
aromatica, Ait.
Vitis Labrusca, L.
vulpina, L.
Ampelopsis quinquefolia, Michx.
Euonymus Americana, L.
Polygala Boykinii, Nutt.
fastigiata, Nutt.
Sesbania macrocarpa, Muhl.
Stylosanthes elatior, Sw.
Schrankia uncinata, Willd.
Psoralea melilotoides, Michx.
var. eglandulosa (?)
Decumaria barbara, L.
Specularia perfoliata, A. DC.
Ludoviciana, Torr.
Fedia radiata, Michx.
Maruta Cotula, DC.
Erigeron strigosum, Muhl.
Ilex opaca, Ait.
Dahoon, Walt
decidua, Walt.
Lobelia Nuttallii, R. & S.
Catalpa speciosa, Warder.
Pentstemon pubescens, Sol.
gracilis, Nutt.
Digitalis, Nutt.
Plantago major, L.
Virginica, L.
Pedicularis Canadensis, L.
Verbena Aubletia, L.
Scutellaria serrata, Andrews.
parvula, Michx.
Dianthera humilis, Gray.
Ruellia ciliosa, Nees.
Physalis Pennsylvanica, L., var. lanceolata
angulata, L.
Capsicum annuus, L. (nat.)
Datura Tatula, L.
Spigelia Marylandica, L.
Asclepias variegata, L.
tuberosa, L.
Asclepiodora viridis, Gray.
Polygonum incarnatum, Ell
hydropiperoides, Michx.
acre, HBK.
aviculare, L.
Euphorbia corollata, L.
var. angustifolia.
Celtis Mississippiensis, Bosc.
Pilea pumila, Gray.

MAY.

Cleome pungens, Willd.
Malva sylvestris, L.
Cocculus Carolinus, DC.
Hypericum Canadense, L., var. major,
    Drummondii, T. & G.
Polygala incarnata, L.
Erythrina herbacea, L.
Passiflora incarnata, L.
    lutea, L.
Rhexia Mariana, L.
Hydrangea quercifolia, Bartram.
    arborescens, L.
Hydrocotyle interrupta, Muhl.
Sanicula Canadensis, L.
Eryngium prostratum, Baldwin.
Discopleura capillacea, DC.
Thaspium barbinode, Nutt.
Sambucus Canadensis, L.
Lonicera sempervirens, Ait.
    grata, Ait.
Cephalanthus occidentalis, L.
Galium hispidulum, Michx.
Helenium tenuifolium, Nutt.
Ceanothus Americana, L.

Desmodium paniculatum, DC.
Psoralea canescens, Michx.
[Gr.Tephrosia Virginica, Pers.
    spicata, T. & G.
    hispidula, Pursh.
Crotalaria Purshii, DC.
Solidago radula, Nutt.
Aster patens, Ait.
    surculosus, Michx.
Echinacea augustifolia, DC.
Rudbeckia hirta, L.
Coreopsis lanceolata, L.
Helianthus occidentalis, T. & G.
    doronicoides, Lam.
Cirsium Virginianum, Michx.
Pyrrhopappus Carolinianus, DC.
Oxydendrum arboreum, DC.
Solanum nigrum, L.
    Carolinense, L.
Forsteronia difformis, A. DC.
Saururus cernuus, Willd.
Phytolacca decandra, L.
Callicarpa Americana, L.

MARTHA B. FLINT, *Brookhaven, Miss.*

"Beitraege zur Morphologie und Physiologie der Pilze, von A. DEBARY und M. WORONIN. Fuenfte Reihe. BEITRAG zur Kentniss der Ustilagineen, mit vier Tafeln."—In this important contribution to Mycological literature we have an attempt to form a philosophical system of classification of the *Ustilagineæ* upon the peculiarities of spore growth and "sporidia" production. It is quite needless to say that it is based upon the quiet assumption that the time has come for giving life history more, and a single phase of life history less weight in our systems of classification. Of course beside the leading idea of the contribution many isolated facts of value find place in this clearly written and beautifully illustrated memoir. We can only give the more important in this brief *resume.*

Plate I represents *Tuburcinia Trientalis*, which in its conidial state covers the under side of the leaves of *Trientalis Europœa*, L. The specimen was taken early in June. Sections made through the young leaves of the host show an abundant ramification of the cross-partitioned hyphæ beneath the epidermis, and between and into the chlorophyll-bearing cells. These threads reach the air *either through a stoma, or sometimes directly between the epidermis cells.* Some of the escaping threads creep in a tortuous manner over the leaf surface; others are erect and terminated by a single inversely pear-shaped conidium. Sowing these conidia on a growing Trientalis leaf and after a short time removing the epidermis it will be seen that the conidial threads have reached the interior of the leaf *between the cells of the epidermis.*

Plate II gives the condition of affairs in late summer, when a transverse section through the stem shows spore masses in the

central, but more largely in the superficial parts of the preparation. The mode of formation of these spore masses is strikingly suggestive of other *Carposporeæ.* Essentially it consists in one or two end cells from the same or different threads becoming bladder-like [and contents dividing into spore masses?], whilst around these, delicate filaments spin themselves so quickly and closely that what transpires in the center can only be conjectured. This outer knot-like protecting case appears from the figures to be more or less completely absorbed or reduced by the growth and pressure of the spore masses.

Examining these affected Trientalis plants in the cold wet weather of autumn it will be discovered that the dark-brown spore masses show signs of growth. Placing these under a microscope and keeping them in a moist atmosphere one may see the individual spores sending out transparent thickish promycelia as growing tubes. Each of these tubes terminates in a basidial cell, which in turn produces 4 to 8 "primary sporidia." The use of the term sporidia in this sense is according to Tulasne. (The same word it is to be observed is used by our American botanists more frequently for the spore-like bodies found in asci of the Ascomycetous fungi.)

See plate III, figures 1-12. Between pairs of these "primary sporidia" copulation occurs at the base laterally, rarely at the summit. It appears that from these "primary sporidia" secondary ones may be produced directly, with or without a previous copulation. After the fall of the "sporidia," the basidia which supported them may give rise to delicate colorless threads. From the secondary sporidia tertiary ones may be produced and copulation occur between them. Or a sporidium may produce another sporidium on one side and on the other a growing tube. Not only two, but three or more primary sporidia may copulate and then may each produce secondary sporidia; or a single sporidium which has not copulated may produce even three successive generations of sporidia. Evidently if this copulation, so-called, has anything whatever to do with reproduction or specific perpetuity, it sits very lightly, so far as necessity is concerned.

In from 15 to 20 days after sowing the conidia of *Tuburcinia* upon the Trientalis leaf the charasteristic black spots appear. Observation has made it very clear that both wind and insects by carrying the conidia aid in infecting plants previously healthy. These conidia, after sending their tubes between the epidermic cells of the host, develop around their point of entry a mycelium mass, each for itself, which remains well divided from those produced by other conidia. This *Tuburcinia Trientalis* furnishes, not the *first*, but the *best* illustration of conidial production among the *Ustilagineæ.*

Tuburcinia has both its conidia and its sporidia on the same host plant, as *Entyloma* has also, but the author hazards the conjecture that other links will be found, comparable to those of the *Uredineæ*, which will fairly make out another example of heteræcism.

For want of space we pass by the experiments upon *Sorospori-*

um Saponariæ, Rudolph, and *Sorosporium Junci*, Rudolph, which are regarded as representing different genera, and accordingly the latter is named *Tolysporium Junci*. Plate IV, figures 1, 2, 3, 4 show the spore masses of this last and the mode of germination; figures 5, 6, 7, 8 reveal the mode of production of the sporidia, which occur in whorls on the thickish, jointed promycelium and copulate by their upper ends.

Thecaphora hyalina, Fingerh., though it has been named *Sorosporium hyalinum*, is distinguished from this genus by both spore structure and mode of growth. As the period of vitality of these spores is but brief, all culture experiments with them must be made with fresh specimens. Plate III, fig 19, shows the brownish-yellow spore balls made up of from 2 to 20 verrucose spores. A very characteristic mark of these is the clear, round spot through which the germinating endospore tube protrudes. It is very suggestive of the Uredospores. This is shown by figures 20–22. Figures 24–26 show, instead of normal sporidia such as are found in *Tolysporium* and most of the *Ustilagineæ*, a number of lateral non-septate branches produced upon the septate promycelium and those (the former) of the same promycelium copulate by their extremities, to accomplish which the lower bend upward and the upper downward, after which a long cell develops, becomes septate, and then accumulates all the protoplasm in its terminal segment.

Sorosporium Astragali and *S. Desmodii*, both of Peck, are regarded on spore evidence as belonging to the genus *Thecaphora*.

Figures 9 and 10 of Plate IV are devoted to formation of sporidia by *Entyloma Eryngii;* 12–18 to *E. Aschersonii;* and 19–26 to *E. Magnusii.* Of these the last two species are removed from their former place in *Sorosporium* and on spore data placed in *Entyloma*. Whilst copulation of sporidia in *Entyloma* is common, it does not occur in *E. Aschersonii*. Figures 27–35 of the same plate show *Melanotænium endogenum*, de Bary, which grows on *Galium Mollugo* and *G. verum*. It was formerly known as *Protomyces endogenus*, Unger, and *P. Galii*, Rabh. Here we find strong mycelium and haustoria, the latter of which sometimes take up one-third of the cell into which they enter. The spores are dark-brown, oval, and germinate by protrusion of the endospore and production of a promycelium, and show in their mode of growth a relationship to *Entyloma*, as de Bary had suggested. From the summit of this strong promycelium several oblong sporidia develop and these copulate by their apices, of course while still attached to the promycelium.

The following is an abstract of the *Ustilagineæ* as arranged in this paper:

I No "sporidia" produced directly from the growing spore.

a. Spores produce many-celled tubes or threads, which remain either simple and unbranched, or whose terminal plasma-containing cell has several lateral, irregular, divided branches. The unbranched terminal joint can for a time live and grow if separated from the empty cells below.

1. SOROSPORIUM, Rudolphi.

S. Saponariæ, Rudolphi.

b. The threads from the spores produce a limited growth which develops into a promycelium; this instead of "sporidia" proper produces slender branches, which, growing toward each other, copulate by their ends. From this point of union another growth begins.

2 **Thecaphora**, Fingerh.

T. hyalina, Fingerh.

II. The promycelium by transverse septa divides itself into several cells from each of which one or more "sporidia" are produced.

3. **Ustilago**, Link. (Persoon, Tulasne.)

4. **Schizonella**, Schroeter (in Cohn's Beitr. z. Biol. d. Pfl. II Bd. p. 362.)

5. **Tolysporium**, mihi.

T. Junci. (Syn. Sorosporium Junci, Schr.)

III. The promycelium produces on its end a whorl of 2 to 8, usually spindle-shaped branches ("sporidia") which by pairs usually copulate sidewise. With or sometimes without this copulation these "sporidia" produce either secondary "sporidia," or long, simple or branched thin mycelial threads.

6. **Tilletia**, Tulasne.

7. **Entyloma**, de Bary. To which genus as before understood the two species *E. Aschersonii* and *E. Magnusii* are added.

8. **Melanotænium**, de Bary.

M. endogenum, de Bary. This may yet be united with *Entyloma*.

9. **Schroeteria**, Winter.

Schr. Delastrina, Winter. (Syn. Geminella Delastrina. Schroeter.)

10. **Urocystis**, Rabenhorst. Of this genus the mode of growth of but four species has been observed, i. e. *U. occulta*, Rab., *U. pompholygodes*, Rab., *U. Violæ*, F. v. Wald., and *U. primulicola*, P. Magnus. *U. Corydalis*, Niessl., (in Thuemen Mycoth. 1626) is more nearly related to *Entyloma* as here understood, but is very different from *Entyloma Corydalis*, de Bary.

11. **Tuburcinia**, Fries.

T. Trientalis, Berkeley and Broome.

IV. Mode of growth unknown. Here however are placed all the species of *Sorosporium*, Rudolph, and *Thecaphora*, Fingerh., whose mode of growth has not been certainly shown; and also the genus

12. **Vossia**, Thuemen.

V. Molinæ, Thuem. (Winter had placed this under *Tilletia*.)

J. T. Rothrock.

Respiration of Plants.—We were once taught that one of the essential differences between animals and plants is that the former exhale carbonic acid and inhale oxygen, while in the latter the process is reversed So long as chlorophyll-bearing plants alone were studied this view was to a certain extent excusable, for the more abundant effects of assimilation obscured the comparatively small effects of respiration. But modern investigation has come to a knowledge of the fact that the activities of every living cell, whether plant or animal, are similar, and that oxygen starvation is just as certain destruction for a plant cell as for an animal cell. The food used and the excretory products are in both cases the same. In regard to chlorophyll-bearing plants then the additional statement can be made that some plants differ from most animals and all other plants in being able to make their own food.

Now this using of food, called respiration, and common to all life, demands the presence of oxygen, and the question has arisen with regard to plants whether this oxygen is derived directly from the free oxygen of the air or is a secondary product resulting from intramolecular decompositions. It has been observed that germinating plants will continue to evolve carbonic acid in an atmosphere of nitrogen or hydrogen, or in a vacuum. Wortmann, observing that the amount of carbonic acid evolved from germinating plants was the same when placed in air or in a vacuum, proposed the theory "that all the carbonic acid produced in plant respiration has its origin in intramolecular decompositions; or, in other words, that the free oxygen of the air takes no direct part in the formation of the carbonic acid in respiration." Dr. W. P. Wilson, an American student at Tubingen, Wurtemberg, has been experimenting upon this subject, and in the *Am. Jour. of Science* for June he gives a condensed abstract of some of his results, which will later be published in full. His experiments show that Wortmann's theory falls to the ground because it is founded upon a fallacy. That there is an intramolecular respiration as differing from a normal is easily proved, but that the amount of carbonic acid given off by the former equals that given off by the latter is untrue, for Dr. Wilson's experiments showed, in every case but one, a rapid diminution in the evolution of carbonic acid when he substituted an atmosphere of hydrogen for air. Hence the conclusion is irresistible that the carbonic acid excreted in plant-respiration is a partial product of direct oxidation from the free oxygen of the air. W. Pfeffer shows that even if Wortmann's experiments had been verified his theory would still fail, because "if an equal amount of carbonic acid were formed in both intramolecular and normal respiration this would only prove that the same number of carbon affinities for oxygen had been satisfied in each case, but would in no way indicate from whence the supply of oxygen came. And in case free oxygen was active in normal respiration, still in intramolecular, when free oxygen was absent, the full supply might yet be obtained through constant powerful attractive forces which could take oxygen from other combinations and in this way give rise to secondary changes." Dr. Wilson's experiments also verify what has previously been taught with regard to respiration, viz., that the presence of light does not in any appreciable degree directly affect the amount of carbonic acid given off, a capital point to use in contrasting respiration and assimilation.—J. M. C.

Notes from Northern Iowa.—*Psoralea esculenta*, Pursh, grows on dry knolls, but rarely matures fruit. This plant, the *Pomme de Prairie* of the voyageurs, has large, starchy roots which are quite palatable to a botanist made hungry by a long tramp. *P. argophylla*, Pursh, is much more common than the former, preferring lower grounds. I have not, after three seasons search, been able to find a single mature seed. It must, however, fruit in favorable years.

Polygonum Hartwrightii, Gray, is common in bogs. It has flowered here but once in four years—the summer of 1880—and I was then so fortunate as to secure a good supply of specimens. None of the plants matured fruit.

Helianthus Maximiliani, Schrad., is very common on the prairies throughout this county. In grain fields it grows much larger, and is almost as troublesome as *H. rigidus*, L. This locality, I believe, is the farthest north from which this species has been reported.

Lespedeza leptostachya, Eng., is common on prairies.

Lophanthus anisatus, Benth., is found in woods near Estherville.

The peculiar *Lygodesmia juncea*, Don., I have found in a few localities. It chooses the driest knolls, where it seems to lead a precarious existence, so much so that I fear it will soon leave us entirely.

Liatris punctata, Hook., produces a large number of stems from the same root; the outer ones generally being nearly prostrate. It is only found on the driest knolls.

Iva xanthiifolia, Nutt., has been introduced from the northwest by cattle, and is becoming troublesome in some places. The plant is an annual, and makes a very rapid growth, the main stem often being over an inch in diameter, hollow, and very hard.

Calamagrostis stricta, Trin., occurs on wet prairies, a few culms only in a place.

Bouteloua oligostachya, Torr., grows on dry, sandy ridges, along with *Carex siccata*, Dew., *Œnothera serrulata*, Nutt, and *Castilleia sessiliflora*, Pursh.

In June, 1880, *Senecio palustris*, Hook., made its appearance along the margin of one of our lakes, and also in wet ground near the state line of Minnesota. The larger plants, with hollow stems over an inch in diameter, grew about three feet high, and bore such a profusion of golden yellow blossoms that it was impossible to press a whole plant in a specimen. Last season not a single specimen could be found, which makes me fear that it did not come to stay.

Last season while searching along the margin of a small lake in the eastern part of this county, I came across a *Potamogeton*, bearing an abundance of large floating leaves. I sent it to Rev. Thomas Morong, of Ashland, Mass., who determined it to be *P. Illinoensis*, described and named by him in the BOT. GAZ., Vol. V, page 50. It was first discovered by Mr. H. N. Patterson near Oquawka, Ills., the only other locality known.

In a large bog, three miles from my home, I have found, within a radius of five rods, *Salix myrtilloides*, L., *Scheuchzeria palustris*, L., *Potentilla palustris*, Scop., *Triglochin maritimum*, L., var. *elatum*, Gr., *Eriophorum gracile*, Koch., var. *paucinervium*, Eng., and *Carex chordorhiza*, Ehrh.—R. J. CRATTY, *Estherville, Emmet Co., Iowa.*

Osmunda cinnamomea, L., var. frondosa, Gray.—I have had growing in my yard for a number of years (brought originally from Pennsylvania) a fine clump of *Osmunda cinnamo-*

mea, and have admired it for its graceful habit. The sterile fronds gently curve backward so that the fertile fronds always stand erect in the center of the urn-shaped growth. There has been no change for ten years in the manner of development till the present season. Now two of the fertile fronds are partly sterile; in one the tip of the frond, for 13 pairs of pinnæ, is fertile, then two pairs partly fertile, the remaining 5 pairs not being distinguishable from the entirely sterile fronds; the other has the tip and base sterile, and 3 pairs of pinnæ out of the central portion fertile, and one pair partly fertile. Although the change from the fertile frond towards the sterile has taken place from the base towards the tip, in the pinnæ that are partly fertile the change is in the reverse order, that is from the tip towards the base. Usually after the discharge of the spores the fertile fronds wither and finally disappear, but in this case they have not withered, as have the other fertile fronds, but mantain their normal upright habit instead of curving backward.—ISAAC C. MARTINDALE, *Camden, N. J.*

The Action of Acids on Cellulose and Starch-grains.—In the BOTANICAL GAZETTE for May a discrepancy is shown between a statement made in Sachs' Text-book of Botany and some facts found by experiment, and an explanation is asked. It refers to the action of acids on cellulose. In the fourth revised edition of Sachs' Lehrbuch der Botanik (Leipzig, 1874.) this discrepancy does not exist. The translation by Bennett and Dyer was based on the third edition, and it is probable some change was made by the author in the later work. But not possessing the translation nor any edition earlier than the fourth, I cannot compare them. The accuracy of the translation may be assumed from the competency of those who made it. The same subject is evidently treated in the fourth edition, page 640, where a paragraph is found referring to the action of acids on cellulose and starch-grains, and a figure of those of *Hoya carnosa* under the influence of this treatment is inserted. A translation of the passage is given below. It will be seen that the per cent. of dilution is not stated, but is presumably somewhere near that found necessary by the experiments in Purdue University. It is with the second mode of treatment that the violent action is said to occur. The first adjective might be rendered "violent," but hardly means this when compared with the second, where the primary meaning is violent.

"Acids (especially sulphuric), greatly diluted with water, cause a stronger swelling (eine starkere Quellung) of starch-grains and cellulose than pure water, without however destroying their organization. After the acid is removed by washing they return to their former condition. But at a higher concentration (bei hoeherer Concentration) the acid produces a violent swelling (eine heftige Quellung) of starch-grains and cellulose; they are changed into a pasty state; the protoplasm coagulates just as it does at a higher temperature. Concentrated sulphuric acid finally destroys their molecular structure completely, causing a chemical change of substance; they are liquefied."—E. J. HILL, *Englewood, Ill.*

Prolonged Vitality of Seeds.—An interesting case of the germination of seeds of the wild crab-apple (*Pirus coronaria*) after lying dormant twenty-three years recently came to my notice. In 1859 Dr. J. W. Smith of this place built a frame barn about thirty feet from his dwelling, the foundation of which was a low wall of limestone laid upon the garden soil. In April of the present year the barn was removed, and twenty days afterward the foundation also. As the Doctor pried up a bottom stone about twenty inches across, two small plants respectively an inch and an inch and a half high straightened themselves into an erect position. They were near the center of the stone and some three inches apart. A number of persons carefully examined them besides the Doctor. There seems to be no doubt that the seeds had been protected by the building for this long period, and that when it was removed sufficient warmth and moisture had penetrated beneath the foundation wall to cause them to grow.—J. C. ARTHUR, *Charles City, Iowa.*

Curious Growth on Gleditschia triacanthos.—Prof. F. L. Harvey, of the Arkansas Industrial University, sends the accompanying figure to illustrate a growth on our honey locust in which

he points out a strong resemblance to an animal standing erect upon thorns, and bearing an armed snout. He mentions two small prominences standing in position and of a nature to represent eyes. The narrowed end was the point of attachment to the tree. There are nine thorns on the front side (two are not shown, being behind a large thorn) and ten on the reverse, only four being shown in part. This monstrosity is curious and of course interesting enough to be recorded.

Botanical Gazette.

Vol. VII. AUGUST & SEPTEMBER, 1882. Nos. 8 & 9.

Editorial.—Mr. Joseph F. James has written a pleasant memoir of Chas. Darwin, which has been published in the Journal of the Cin. Soc. Nat. Hist.

Rev. A. B. Hervey sends word of the death of Dr. G. Dickie, F. L. S., of Aberdeen, Scotland, a well known British Algologist, which occurred July 15th.

Mr A. C. Palmer, in the *Am. Monthly Micr. Jour.*, calls attention to the fact that *Naias flexilis* furnishes a fine illustration of cyclosis, even better than the stock examples, *Vallisneria* and *Anacharis*.

A correspondent, referring to Mr. Arthur's note on page 88 of the last Gazette asks: "Is Mr. Arthur quite sure that rats, or other vermin, had not carried the crab apples under the stone and left the seeds?"

F. Reinitzer propounds the theory that transpiration is an injurious agent, a necessary evil, in the life of the plant. This view he founds on the fact that transpiration exercises a retarding influence on growth.

M. Alph. DeCandolle has just distributed a small pamphlet containing two papers; the first "Sur un Caractere de la Batate," and the other "Observation de M. Meehan sur la Variabilite du Chene Rouvre (*Quercus Robur*) et Remarque de M. Alph. DeCandolle."

Rev. E. L. Greene, in the *Torrey Bulletin* for September, describes seven new Californian *Compositæ*, four of which belong to the genus *Hemizonia*. Mr. Greene is coming rapidly to the front as a publisher of new species and his work among our western plants has been invaluable.

Karl Richter has determined that the substance of the cell-wall of Fungi fails to display the ordinary reactions of cellulose because of the intimate mixture of the cellulose with a foreign substance which he eliminated by treating for a prolonged period with potash and washing with a weak acid, after which the blue coloring with chloriodide of zinc is obtained.

The "cucumber odor" of the water which has been troubling Boston so much, has been traced to the presence, not of plants,

but of a fresh water sponge. The Nostocs must still stand responsible for the "pig-pen" odor, but the "cucumber odor" we hand over to zoologists.

MR. FOERSTE, of Dayton, Ohio, writes that he has received a postal card from Mr. Wm. Trelease saying: "I have noticed protogyny in *Thaspium aureum* and *Sanicula*, so I no longer have any doubt as to the accuracy of your observations on *Erigenia*, though the fact of this sort of dichogamy occurring in *Umbelliferæ* was entirely unexpected from the uniformity of protandry in the earlier studied genera.

THE PROCEEDINGS of the Davenport Acad. of Nat. Sci., Vol. III, Part II, are at hand. The botanical articles are by Prof. J. C. Arthur and Dr. C. C. Parry. The former makes still farther addition to his catalogue of Iowa Plants; while the latter describes two new species of *Oxytheca* from Southern California. The new species are named *O. caryophylloides* and *O. Parishii* and were both discovered by the brothers Parish in the San Bernardino Mountains.

ON PAGE 78 of the July GAZETTE it might be inferred that Baillon's work among the *Compositæ* was thought more commendable than even that of Mr. Bentham. No reader of the GAZETTE should labor under such a delusion. Because Mr. Bentham with immense labor has worked up the vast order and acknowledged 780 genera, and Baillon, putting a good part of the genera shown to be near into one, reduces the number to 403, is no indication that the work of the latter is either "philosophical or practically convenient," for it is very easy work to do.

PROF. HENRY G. JESUP, of Dartmouth College, has published a very handsome pamphlet entitled "Flora and Fauna of Hanover, N. H." The list of plants includes the flowering plants and higher cryptogams, just such as are included in Gray's Manual. The range includes the flora within thirty miles radius of the town of Hanover and contains a great diversity of conditions, such as mountain peaks, valleys, and lakes, and, as is to be expected, the list is an exceptionally rich one. The summary shows a total of 1008 species, of which 286 are *Polypetalæ*, 265 *Gamopetalæ*, 96 *Apetalæ*, 52 Cryptogams. Introduced phænogams number 144.

MR. J. M. MACFARLANE, Demonstrator of Botany in the University of Edinburg, finds a new factor in the vegetable cell, which he proposes to call the *nucleolo-nucleus*. It is a well marked body inside the nucleus, round or slightly oval in outline, and exhibits a clear bounding wall differentiating it from the substance of the nucleolus. It was first seen in the epidermal cells of *Ornithogalum pyramidale*, after staining fresh epidermis with a ¼ per cent. solution of eosin in common methylated spirit, and was afterwards found in many other Phanerogams and also in some Cryptogams. Mr. Macfarlane concludes that the nucleus, nucleolus and nucleolo-nucleus are invariably present, *if the cell is still active.*

PROF. J. C. ARTHUR reports a very successful session of the Summer School at the University of Minnesota. There were forty students at work in the botanical laboratory and all were enthusiastic, as might be expected. For the benefit of botanists who suppose that some distant locality furnishes better illustrations for study than home plants, and who so often connect the lower forms with something distant and unattainable, we quote the following from Prof. Arthur's private letter:

"We found *Chara* wherever we went. There was an equal profusion of *Nostocs*, and *Desmids*. *Nitella*, *Vaucheria*, *Volvox*, *Hydrodictyon* and *Mesocarpus* were specially abundant. Numerous large and handsome slime-moulds were found on the side-walks, and we were also able to study every stage of the polymorphous *Puccinia*, even to the germination of the teleutospores."

THE CURRENT "PART" of the Proceedings of the Philad. Acad. Sci. contains two papers of botanical interest, both by Mr. Thos. Meehan, whose restless eyes and pen are ever observing and recording. In one of them is recorded the fact that *Salisburia adiantifolia* is sometimes hermaphrodite; while in the other, which is a much more formal paper, are recorded some observations on the relation of heat to the sexes of flowers, based chiefly on a study of the maple and which concludes with the following generalizations:

Male flowers do not appear on female maple trees till some of its vital power has become exhausted.

Branch-buds bearing female flowers have vital power sufficient to develop into branches.

Branch-buds bearing male flowers have not vital power enough to develop into branches, but remain as spurs which ever after produce male flowers only.

Buds producing male flowers only are more excited by heat than females, and expand at a low temperature, under which the females remain quiescent.

PROF. H. BAILLON, wishing to germinate some seeds of walnut and almond trees in winter, thought to obtain a more rapid development in a warm house in which the temperature varied during the twenty-four hours from 15° to 25° (59–77 F.) than in a cool house in which the daily variation was between 5° and 15° (41–59 F.), but the trial failed. In the cool house in the course of six weeks the walnuts had stems of about two decimeters in height, while the most advanced in the warm house had stems of only two or three centimeters. At the end of two months and a half the seeds growing in the warm house had roots only occasionally well-developed, but little or no caulome outside the fruit. When walnuts were germinated in a warm house with "bottom heat" the tap roots were early arrested in their development though growing in a very friable soil consisting of moist sawdust; whereas when germinated in a cool house, without bottom heat, the tap roots grow well in length before the egress of the plumule. The same results were obtained

with almonds, thus seeming to show that with some seeds nothing is to be gained by forcing them.

PROF. EMERSON REYNOLDS, F. R. S., has lately shown that well-marked differences in physiological activity between metameric bodies of comparatively simple constitution can be detected with aid of plants. Ammonium sulphocyanate and its metamer, theocarbamide, both compounds rich in nitrogen and easily soluble in water, were selected for experiments during the summer of 1882 upon plants of *Nicotiana longiflora*. From August to the end of November a certain number of plants were watered with rain water, and a certain number with the compounds in solution. The following table shows the chief results:

	Rain-water.	Theocarbamide.	Sulphocyanate.
Total height in inches........	31	23	12
No. of leaves..............	15	14	13
Maximum length of lvs.......	9 5	15.25	8
Maximum breadth of lvs......	4.25	6	2.5
No. seed pods................	9	15	0
Ditto well-developed...	1	11	0

It would thus seem that the particular elements of which a body is composed exert less influence on its physiological activity than the method in which the component atoms are grouped.

Some New Grasses.—MUHLENBERGIA SETIFOLIA.—Culms erect, 1½ to 2 ft. high; radical leaves numerous, 4 to 6 inches long, setaceous, involute, recurved at the tips, those of the culm 2 or 3 and similar; stipules membranaceous, acute; sheaths 4 to 6 inches long, smooth; panicle 4 to 5 inches long, narrow, erect, branches of panicle erect, filiform, in twos or threes, about 1 inch long, once or twice dividing near the base and each with 2 to 4 flowers mostly on short filiform pedicels; outer glumes minute, less than one line long, oblong, obtuse, scarious, erosely toothed at the apex; flowering glume 2 lines long, with a short thick callus, obscurely 3-nerved, smooth, lanceolate, acuminate, terminated with a slender awn twice or thrice its own length; palet of same texture and nearly equal length, 3-nerved.

Collected on the Gaudalupe Mountains of Western Texas by *Dr. V. Havard*, of the U. S. Army.

MUHLENBERGIA GLOMERATA, var. BREVIFOLIA.—Culms 1½ to 2 ft. high, erect and leafy, leaves (5-8 on each culm) rigid, short and wide (2-4 inches long, 2-3 lines wide), somewhat scabrous; panicle spikelike, interrupted and with longer branches below; glumes and palets about equal in length (1 line), glumes acuminate, scabrous-puberulent; flowering glume acuminate and tipped with an awn half its length or less, 3-nerved, pubescent below; palet acute, about equaling the flowering glume.

Collected in S. E. California by *Mr. S. B. Parish.*

Muhlenbergia sylvatica, var. Californica.—This grass has the spreading, diffusely branched habit of *M. sylvatica*, and should probably be ranked as a marked variety of that species.

The narrow panicles terminate the long, leafy, terminal and lateral branches, are 4 to 6 inches long, the rays mostly alternate, the lower ones distant and subspicate, some of them 1 inch long, the spikelets sessile and crowded on the branches; the outer glumes membranaceous, except the hispid green keel, equal, lanceolate, acuminate, scarcely 2 lines long, rather exceeding the flowering glume without its awn; flowering glume about 1½ lines long, firm, finely scabrous, acute, and terminating in a straight awn about its own length, sparingly villose at the base; palet about as long as its glume, acute.

Collected on the San Bernardino Mts., California, by *Mr. S. B. Parish.*

Notulæ Californicæ.—The fact has hitherto been strangely overlooked by Californian botanists, or at least, it has been mentioned by no one, that the most common *Convolvulus* of California has the character of an evergreen shrub, often ascending trees to the height of twenty feet, and showing great lengths of woody, grape-vine like stems frequently near an inch in diameter. The species is *C. occidentalis*, Gray, supposed by that author to be an herb like *C. sepium*, L., to which it is, in floral character, closely related. The young plants are indeed wholly herbaceous, and when only these are seen, trailing over the ground, or supported on low bushes and flowering profusely, it may easily pass for a mere herb. I have admired almost daily for a year past a beautiful specimen which grows by a brookside in the midst of the village of Berkeley, and only very recently did it occur to me as singular that a *Convolvulus* so much like common bind-weed should be displaying its festoons of leaf and flower from only the very topmost branches of a tree twelve or fifteen feet high, and that during the whole year. The examination thus suggested to my mind brought to light the dark-barked, lithe and tortuous woody stems which, in no wise attached to the trunk of the tree, rose from the ground directly up to the lower branches, after the manner of wild grape-vines; and this, now that my attention has been called to the fact, I find to be the universal habit of the species, except in the case of plants only two or three years from the seed. The most luxuriant growth of this plant which I have met with is on Goat Island in San Francisco Bay.

On the northern slope of this mountain island is an extensive grove of live oak (*Quercus agrifolia*) of rather small size; but many of these trees have their crowns completely and beautifully mantled, so that their own foliage is hidden, by the masses of the shrubby morning-glory whose corollas are here, as I have seen

them no where else, of a rich purplish hue. On the mainland they are apparently always cream-colored.

Convolvulus arvensis, L. a foreigner, is already more abundant throughout the region of San Francisco Bay than any other species, and is a very troublesome weed in the wheat fields. At the time of my writing the stubble fields are white every morning with its flowers, for it persists in growing and blooming however closely cut down by scythe and sickle.

No species of the cruciferous genus *Cakile* appears yet to have been reported from any Pacific shore. But what appears to be *C. Americana*, Nutt., is abundant on the beach at West Berkeley. Its only associates there are the indigenous Abronias, Franserias, and the like Pacific Coast maritime species, yet in all probability it is an introduced plant.

Chrysanthemum segetum, L., a plant nowhere mentioned as even adventive on this continent, has become thoroughly established in fields and by waysides a few miles north of Berkeley. Being an annual, and well able by its seeds to survive the half year's drouth, it may possibly become the troublesome weed in California which its sister species, *C. Leucanthemum*, L., has long since become at the East.

Picris echioides, L., the type of an Old World genus allied to *Crepis*, from which it differs in having a plumose pappus, grows wild in great abundance near Vallejo. *P. hieracioides*, L., common in Australia, is the only other species of this rather large genus which seems to have obtained a foothold in any part of the New World, and is the only one which would have been expected to establish itself in California. But this which runs wild on even the uncultivated hills, almost choking out the indigenous tarweed, is certainly the well marked *P. echioides*, new to our continent, and perhaps destined to be troublesome as a coarse weed.—EDWARD LEE GREENE, *Berkeley, California.*

Parishella Californica.—To the scientific botanist there is no more interesting genus than Nuttall's *Nemacladus*; and I will remember the satisfaction I had when (in the year 1875) I detected its affinities with the *Cyphieæ* of South America and South Africa. More recently I had the pleasure to describe a second species of this curious genus. In botanizing this last spring upon the Mohave desert, those sharp-sighted botanists and most obliging and excellent correspondents, the brothers Parish, of San Bernardino, California, had the rare fortune to discover a little plant, which upon examination proves to be a new genus of this group. I wish here merely to say that I have taken the opportunity thus afforded to dedicate it to the discoverers, in token of my appreciation of the very valuable services which they have rendered, and are zealously rendering to botany and to botanists. Without here entering upon a formal description, I can mention the distin-

guishing characters of this little plant. It is more humble than *Nemacladus* in that it spreads upon the ground, rising little above its surface, but forming depressed tufts; but its white flowers are comparatively conspicuous. Besides its peculiar habit and its rosulate tufted spatulate leaves, the new plant differs from *Nemacladus* mainly in its almost rotate and equally 5-cleft corolla, which is shorter than the foliaceous lobes of the calyx; in the tube of the latter being adnate up to the summit of the ovary; and in the dehiscence of the capsule by an operculum, the short conical apex separating by circumcision.

There is already a genus *Parishia*, an East Indian tree; so this little herb must take the name in an altered and diminutive form. The specific name might have been chosen from the desert habitation or some characteristic feature of the plant; but it is fitting to associate it with the name of the State in which the Messrs. Parish reside, and the botany of which they have most largely helped to make known.—ASA GRAY.

Notes from Canada.—Having in the latter part of June, made a collecting tour with my friends. Professor Macoun, Dominion Naturalist; Mr. Wm. Saunders, Editor of the Canadian Entomologist; and Mr. James Macoun, to Point Pelee, Essex Co., Ontario, the most southern point on the mainland in Canada, a list of the rarer plants found there might not be void of interest to some of the readers of the GAZETTE. The list is chiefly remarkable for the southern nature of most of the species enumerated, some of them so much so, that I had not dreamed of finding them within our boreal confines. To this locality never before having been thoroughly explored, may be attributed the seemingly extraordinary fact, that of the plants mentioned, the first eleven have not, I believe, been heretofore recorded as found in Canada, while the remaining, ten have but very rarely been noted.

Corydalis flavula, DC.	Smilax tamnoides, L.
Hibiscus Moscheutos, L.	Asimina triloba, Dunal.
Ptelea trifoliata, L.	Sisymbrium canescens, Nutt.
Gleditschia triacanthos, L.	Cerastium oblongifolium, Torr.
Opuntia Rafinesquii, Eng.	Phaseolus helvolus, L.
Nyssa multiflora, Wang.	Baptisia tinctoria, R. Br.
Ipomœa pandurata, Meyer.	Galium pilosum, Ait.
Fraxinus quadrangulata, Mx.	Vernonia fasciculata, Mx.
Morus rubra, L.	Acerates viridiflora, Ell.
Quercus palustris, Du Roi.	Fraxinus viridis, Mx. f.

Quercus Prinus, L.

The large size and plentitude of the Papaw, Mulberry, Blue Ash, and Sour Gum trees clearly show them to be indigenous, and would indicate that they are not merely chance survivors, but that the soil and climate fully meet their requirements.

I might add, that during the week preceding our trip, Professor Macoun had found along Lake Erie, at Amherstburg, Pelee Is-

land; and in the neighborhood of Port Stanley, the following plants, no less than eight of which also now for the first time find a place in Canadian Flora. The coffee-tree, he tells me, was seen reaching two feet in diameter.

Viola cucullata, Ait. var. palmata, Gr.	Thaspium trifoliatum, Gr.
Euonymus atropurpureus, Jacq.	Thaspium barbinode, Nutt.
Gymnocladus Canadensis, Lam.	Cynthia Virginica, Don.
Agrimonia parviflora, Ait.	Chærophyllum procumbens, Crantz.
Geum vernum, T. & G.	Tecoma radicans, Juss.
Rosa setigera, Mx.	Plantago cordata, Lam.
Cratægus subvillosa, Schrader.	Prosartes lanuginosa, Don.
Heuchera hispida, Pursh.	Carex Steudelii, Kunth.

Carex Grayii, Carey.

—T. J. W. BURGESS, M. D., *London, Ontario, Canada.*

Some Alaska Ferns, with notes.—Dr. J. Schneck has kindly placed in my hands his entire stock of duplicate ferns, among them the following Alaskan species, a record of which may be interesting. They were all collected by Mr. L. M. Turner during the seasons of 1879–80–81.

1. *Ophioglossum vulgatum.*, L. Specimens exhibiting marked variations in the shape of the laminæ, the most noticeable being a broadly, triangular-ovate form with an abruptly acute apex. Sporangia varying from 10 to 20, or more, in number.

2. *Botrychium boreale*, Milde. Specimens showing nearly the range of forms described by Angstrom (Botan. Notiser, 1866, and quoted by Milde in Botrychiorum Monographia), viz:—*evolutum, intermedium* and *affine*. As these, and the next specimens, have furnished me with much new material for examination, I shall have more to say of them hereafter in connection with their vernation.

3. *Botrychium Lunaria*, Swz. A large number of fine specimens showing many forms running from the normal form (var. *normale*, Roper) through var. *sub-incisum*, Roper, and var. *incisum* Milde, toward, though not quite reaching var. *ovatum*, Milde. The collection furnishes two interesting examples of forked rootstocks. In one specimen the rootstock had made three short branches, two of which had developed buds and given rise each to a perfect frond, thus forming a double-fronded plant. In the other, and larger of the two specimens, the rootstock had divided into two longer divisions each bearing a well-developed frond. Examining the vernation in this specimen I found that the base of each stipe contained a perfect bud showing no variation from the normal development. Milde (l. c.) described similar examples in this species, and in *B. simplex*, and, as of rarer occurrence, in the present species, and *B. boreale*, instances where the bud which should not have developed until the next year had broken through the base of the stipes and developed into a perfect frond so that two individuals appeared close together from one rootstock in the same season.

4. *Botrychium lanceolatum*, Angstrom. Specimens fleshy but not showing any marked variation.

5. *Botrychium ternatum*, Swz. Specimens variable, most of them nearer the *obliquum* form than the type, and very fleshy.

6. *Botrychium Virginianum*, Swz. Specimens (2 in number) small, but one of them especially interesting, having two perfect fronds from the same rootstock. In this instance it is clearly apparent from the manner in which the base of the stipe of one frond sheathes the base of the other, that the bud which should not have developed until another year had pushed out prematurely and developed soon after the regular frond. The two individual fronds had grown to very nearly the same height and dimensions. The bud for the third year's growth lies snugly tucked away in the vertical slit at the base of what should have been the second year's frond, and a repetition of the condition described could not have been expected another season as in the instances mentioned in *B. Lunaria*, where the branched rootstock had made the permanent existence of two individuals possible.

7. *Polypodium vulgare*, L. A single small plant.

8. *Cryptogramme acrostichoides*, R. Br. A large number of fine specimens among which I find two fronds partly fertile and partly sterile, the two lowermost pairs of pinnæ being wholly sterile in one, and with a few scattered sori in the other; the upper portion of both fronds being contracted in fruit exactly as in the other fertile fronds.

9. *Asplenium Filix-fœmina*, Bernh. A single small frond.

10. *Phegopteris Dryopteris*, Fee. Specimens characteristic, but the fertile somewhat more rigid than usual.

11. *Aspidium Lonchitis*, Swz. Specimens mostly small, but characteristic. A single double-fronded specimen occurs caused by the cohering together of the bases of two stipites.

12. *Aspidium Oreopteris*, Swz. Specimens collected late, and not in good condition.

13. *Aspidium spinulosum*, Swz. A large number of specimens mostly of the *dilatatum* form.

14. *Cystopteris fragilis*, Bernh. Specimens showing the usual variations so characteristic of the species. A single frond forks above the lowermost pair of pinnæ into a two-branched top.—GEO. E. DAVENPORT, *Medford, Mass.*

The Postage Question.—WASHINGTON, D. C., July 1, 1882.
EDITOR BOTANICAL GAZETTE:

Dear Sir—The note of Mr. Trelease on "The Postage on Botanical Specimens," published in your June number (p. 73), still leaves the question open as to what kind of labels will be allowed to go with the specimens, many supposing

that so far as botanists are concerned, the old liberal ruling is still in force, and that the statement on page 234 of the "Guide to the Flora of Washington and Vicinity," was wholly incorrect. While for one I should only be too glad if this were the case, I still presume that the chief desire of all botanists is to know precisely how the laws are construed by the Post Office Department at the present time, and with this object in view I have not only revisited the Department, but have corresponded officially with it, and if not trespassing too largely upon your columns, I would be glad to have the correspondence published. It seems to cover the whole ground and may render further inquiries unnecessary.

I desire to say, however, in advance, that the statement in my flora was too strong and really inaccurate, and especially, that the word "third-class" was an error for *fourth-class*, which was overlooked in reading the proof.

Very truly yours,
LESTER F. WARD.

NATIONAL MUSEUM,
WASHINGTON, D. C., June 21, 1882.

HON. TIMOTHY O. HOWE, Postmaster General:

Sir—I enclose a leaf from Bulletin, No. 22, of the National Museum, of which I am the author, upon which [p. 234] are marked passages relating to the sending of written labels with botanical specimens.

Since the publication of the Bulletin the Department has been asked whether the statements therein were correct, and has replied by sending copies of the Postal regulations of February 21. 1881, and calling special attention to the 7th exception by underscoring the word "name" on the last line but one, which action has been published in the BOTANICAL GAZETTE (June 1882, p. 73).

The impression seems to prevail that this exception will apply to botanical labels made out in the usual way, of which three samples are inclosed within.

As labels without *authority*, *locality*, or *date*, are of no scientific value it is supposed that these would be construed as necessary "for purposes of identification," and therefore legal.

You are respectfully requested to state whether the Department so construes the regulation, and if not, to indicate such portions of the inclosed labels as would be illegal, and to return the same for the information of the profession, who, rest assured, need only to know the law in order to comply with it.

Very respectfully,
Your obedient servant,
LESTER F. WARD.

POST OFFICE DEPARTMENT,
OFFICE OF FIRST ASS'T POSTMASTER GENERAL,
WASHINGTON, D. C., June 24, 1882.

LESTER F. WARD, ESQ., National Museum, Washington, D. C.:

Sir—Your communication of the 21st inst., addressed to the Postmaster General, has been referred to this office for reply.

The labels submitted by you, so far as they contain simply the name of the plant, and as necessary to fix that name, the name of the person making the classification, adding, as part of the name, the variety, and the name of the person classifying, will be held to be within the language of the Statutes. But it is impossible, by any fair construction, to authorize a statement of the kind of soil in which the plant grows, or the locality from which it comes, or the date at which the plant is obtained, or the date at which it flowers, or yields fruit.

All these descriptive matters might be placed upon the label, by the use of a gelatine pad, thus making a reproduction of the matter; or, by the use of a hand stamp. You are respectfully referred to Rulings 319 and 320, January Postal Guide, 1882, page 719, a copy ot with guide will be sent to you, through the Post Office.

Your labels and communication are respectfully returned.

Very respectfully,
E. C. FOWLER,
For First Assistant Postmaster General.

Decumaria barbara.—On May 29th of this year, in company with Dr. Frank Baker, I paid a brief visit to the Dismal Swamp of Virginia. My principal object was to find if possible that handsome vine, *Decumaria barbara*, L., which I had seen in the swamp in 1876, when, in company with Prof. Chickering and Mr. Morong, I had enjoyed a three days' sojourn in that wilderness of amber-colored waters.

As on that occasion the plant was not seen till we had penetrated far into the swamp on what is known as the Jericho Canal to near the open lake, and as on the present one, starting from Bowers Hill Station on the Seaboard & Roanoake R. R., we could only find ditches that would lead us in a distance of about two miles, we were by no means sanguine of success. But successful we were, and found many large and beautiful vines climbing the great gum trees. They were in full bloom and the problem was to reach the flowers.

As your readers probably know, this vine climbs by means of fine rootlets, after the manner of *Rhus Toxicodendron*, which it much resembles in many other respects, and with which it vies in the Dismal Swamp for the posession of the finest supports. To climb to the lowest flowering branches was impossible, and after reaching the verge of despair, the thought struck us of severing a

vine at the base, and, by detatching it for a long distance from the tree to which it clung, to bring down, if possible, the flower-bearing portion. Though a barbarous proceeding we nerved ourselves to it and our efforts were crowned with abundant success.

This plant, as your readers all probably know, is not described in Gray's "Manual," fifth edition, but whether its discovery in the Dismal Swamp in 1876, on the occasion above mentioned, was its first appearance north of the southern boundary line of Virginia, I do not know. However that may be, I thought it might interest some to know that it had been found at the northern border of the swamp and within ten miles of Norfolk.—LESTER F. WARD.

Proterogyn in Sparganium eurycarpum.—In a marsh near the Eastern Branch of the Potomac I found a few days since the finest patch of *Sparganium eurycarpum* that I ever saw, the developed white blossoms being conspicuous from a distance. On approaching and examining them I perceived that the plant was very obviously proterogynous. The two distinct states were so clearly marked that they gave the appearance of two kinds of plants. Those on which the fertile heads were developed and the stigmas ready to receive pollen invariably had all the staminate heads undeveloped, while those in which the staminate heads were developed had in all cases commenced to form fruit. Still a third state occurred in which anthesis was entirely past in both kinds of heads and large heads of fruit had formed. While the order of development of the pistillate and staminate heads was always the same, abundance of plants existed in both states, so that fertilization was possible, yet a careful search failed to reveal a single plant in which the time of expansion of the male and female flowers was synchronous—*i. e.*, in which self-fertilization could have taken place.—LESTER F. WARD.

Contributions to North American Botany, by Asa Gray: Proc. Am. Acad. Vol. XVII.—It is almost impossible to appreciate the amount of labor represented by this contribution. In his elaboration of the vast family of *Compositæ* as displayed in North America, Dr. Gray's work has been of the most laborious and intricate kind. No living botanist could have conducted us half so well through such a bewildering maze of forms and synonyms, and the consultation of type specimens in the older herbaria has not in all cases shed a flood of light. Probably *Aster* and *Solidago* are two of the most vexatious genera of this great family as all botanists will testify in whose herbaria are lurking many unplaceable forms. The first part of this paper is devoted to the record of some of the results of the study of these difficult genera in the older herbaria and their difficulty can best be appreciated when Dr. Gray, who has seen more type-specimens of the species and has given more time to the systematic study of these genera than any one testifies

that "in certain groups absolute or practical definition of the species by written characters or descriptions is beyond my powers." The greatest confusion seems to have arisen from the fact that many old species were established upon cultivated plants and others upon a perfect medley of forms, which being resolved leaves nothing behind upon which to establish a species and a name must be suppressed. For instance, *Aster Novi-Belgii*, L., disappears, being swallowed up completely by neighboring species; which is also the case with *A. miser*, L., and *A. Tradescanti*, L., although in this last case the old name claims a small share, the rest all disappearing under *A. paniculatus* Lam., and *A. vimineus*, Lam. The name *A. linifolius* subsides from the American Flora, and so it goes, until in the forthcoming work on *Compositæ* it will take us many a day to get the run of our Asters.

As for *Solidago*, which now numbers nearly 80 species in North America, Dr. Gray gives a general arrangement under the three sections VIRGAUREA (which is made to include the old *Chrysastrum*), EUTHAMIA, and CHRYSOMA. Under the first section the species are arranged in five groups, *Squarrosæ* (§ *Chrysastrum*, T. & G.), *Glomeruliflorœ*, *Thyrsifloræ*, *Paniculatæ*, and *Corymbosæ*. But few of the changes can be noted. For example, *S. thyrsoidea*, E. Meyer, becomes *S. macrophylla*, Pursh; the vars. *multiradiata* and *humilis* of *S. Virgaurea* are acknowledged as species; *S. virgata*, Mx., falls under *S. stricta*, Ait.; the *S altissima* of the Manual is *S. rugosa*, Mill., *S. Muhlenbergii*, T. & G. comes under *S. arguta*, Ait.; and *S. gigantea* is but a variety of *S. serotina*.

In the same contribution are the descriptions of many new species, mainly from Arizona and adjacent districts. A new buckeye from Lower California is an interesting discovery and many well-known genera receive large additions. A synopsis of North American species of *Baccharis* (18 in number) is given. Three new genera are described, all *Compositæ*; *Plummera*, from Southern Arizona, related to *Actinella* and named in honor of Mrs. J. E. Lemmon; *Dugesia*, from Northern Mexico and dedicated to Prof. Alfred Duges, a Mexican Zoologist; and *Hecastocleis*, from Nevada, a member of the *Mutisiaceæ*, and whose generic name alludes to the separate enclosure of each flower in its involucre.

A footnote informs us that the unequal insertion of the stamens will no longer serve to distinguish *Collomia* from *Gilia* and that hence Nuttall's *Collomia* must be remanded to the already large genus *Gilia*.—J. M. C.

Contributions to American Botany, by Sereno Watson; Proc. Am. Acad., Vol. XVII.—The larger part of this contribution is devoted to a list of the *Polypetalæ* from S. W. Texas and N. Mexico, collected chiefly by Dr. E. Palmer in 1879–80. The list is

a long one and includes over 50 new species. A synopsis of N. Am. *Desmanthus* is given, which shows 10 species.

The rest of the contribution contains the descriptions of new species, chiefly from our Western Territories. *Astragalus* receives 5 new species; *Eriogonum* 4; *Arabis*, *Caulanthus*, *Silene*, *Atriplex*, each 3; and *Myosurus*, *Claytonia*, *Arenaria*, *Malvastrum* (one from Florida), *Lupinus*, *Dalea*, *Sedum*, *Cotyledon*, *Œnothera*, *Allium*, each 2. The distinguishing characters of our four species of *Physaria* are given. *Lupinus Plattensis* is the specific name given to *L. ornatus*, Dougl., var. *glabratus*, Watson.

A discovery of special interest to eastern botanists and all those who use our eastern manuals is that of *Pedicularis Furbishiæ* on wet banks of the St. John's River, at Van Buren, Arostook Co., Maine, and extending along the river for sixty miles. This species is allied to *P. Canadensis* and *P. bracteosa* and is dedicated to its discoverer, Miss Kate Furbish, who has worked so successfully among the plants of her native state.—J. M. C.

Native Trees of the Lower Wabash in Illinois and Indiana, by Robert Ridgway.—This is the substance of the title to a paper published in the Proceedings of the U. S. National Museum, and to the author we are much indebted for advance sheets. Mr. Ridgway has made a careful study of the trees of the Lower Wabash and White River Valleys, and with the help of Dr. J. Schneck. of Mt. Carmel, Ill., has made this a most interesting and valuable paper. If space permitted we would like to publish copious extracts from it, but in this notice will have to be content with a meager outline. The author aptly describes our Southern Indiana forests as distinguished from those of more eastern districts by the absence of coniferous trees and the great variety of species growing together. Our woods are most decidedly "mixed woods" and 40 to 50 species are given as growing indiscriminately upon areas of 50 to 75 acres.

In regard to size, many measurements were taken, showing a most liberal growth. At least 34 species of trees reach or exceed a height of 100 feet; no less than 11 reach a height of 150 feet; and the greatest height recorded was that of a *Liriodendron*, being 190 feet.

The paper contains a list of 92 species with very interesting notes, the longest being upon our Tulip tree, or "Poplar" (*Liriodendron tulipifera*), the most magnificent of our trees; the White Elm, or "Red Elm" (*Ulmus Americana*), with its spurs or buttresses at base and its parasite, the mistletoe; the Sycamore (*Platanus occidentalis*), the largest hardwood tree of North America, with greatest girth and most massive branches, in one case the measurement about the base being 42 feet, and reports of others much larger, even to 66 feet; the Bald Cypress (*Taxodium distichum*)

whose presence so far north can only be accounted for by the open and low north and south valley of the Wabash. The occurence of this last tree is so peculiar that a short extract from Mr. Ridgway's paper concerning it will be of interest.

It grows in the lower part of Knox County, Indiana, or that portion embraced between the Wabash and White Rivers and known as "The Neck." It is very abundant, the area embraced by the cypress swamps, and largely timbered with cypress, being estimated at 20,000 acres.

"Although known as the 'Cypress Swamp,' it consists of a series of beautiful, secluded ponds, hidden in the dense forest, and difficult of access by any one not familiar with the locality." "The cypress trees grow chiefly around the borders of these ponds and along the sloughs connecting them, as well as on the one which empties into the river. Being so near the river, into which the logs are floated at "high water," the finest trees have long since been destroyed, and there are very few left whose symmetry is not marred by low-growing branches or knots upon the trunks. The largest standing tree observed by me was a very old and exceedingly rough specimen, entirely unfit for lumber or shingles. The swollen base measured 45 feet in circumference at the ground, the girth immediately above the conical portion being 21 feet; the trunk consisted of several upright stems grown together for the greater part of their length, but in places distinct, with one very conspicuous transverse growth joining the two main stems, at a height of about 50 feet from the ground. The top expanded 94 feet, the greater part of it elevated over 100 feet from the ground. A solid stump, measuring 38 feet around at the ground, was 22 feet in girth at 8 feet; at about 15 feet it divided into two main trunks of equal size, which were cut off immediately above the fork, a scaffold being necessary for the purpose." "The tallest did not much exceed 140 feet, their average height being little, if any, over 100 feet; and even the finest of them would not compare for symmetry and length with the Sweet Gums and Ashes with which they were associated."—J. M. C.

Notes from S. Illinois.—While collecting parasitic fungi in Southern Illinois last Spring, I found on shelving rocks at Makanda, Jackson Co., a fungus on a species of *Œnothera*. The fungus (an *Uromyces* accompanied by an *Æcidium*) is probably a new species and the *Œnothera* is new to the Northern United States. The latter did not agree with any description in the Manual, and specimens were sent to Dr. Geo. Vasey who determined it to be *Œnothera linifolia*, Nutt. I found the same in a similar situation near Tunnel Hill, Johnson Co. It was plentiful in both localties. At the latter place I also found *Silene Virginica*, L., which was previously reported in Illinois only "on wooded banks of Desplaines

River near Chicago." *Dodecatheon Meadia*, L., var. *Frenchii*, Vasey, grows there at the base of overhanging cliffs. It is smaller than the usual form, has fewer flowers and thin ovate-cordate leaves on margined petioles, constituting a well-marked variety.—A. B. SEYMOUR.

The female Flowers of Coniferæ.—Professor Eichler's paper on this subject, reviewed in the May number of this Journal, has induced Professor CELAKOVSKY to re-investigate this subject, morphologically so important, and to which he had already devoted much attention. In the Abhandl. d. K. Boehm. Ges. d. Wiss. he has recently published his present views, in an extensive article, illustrated by a plate. After reviewing the different theories and explanations enunciated since Robert Brown's time, he dwells emphatically on the great importance of the study of the *anamorphoses* (as he calls those monstrosities which are the result of retrograde metamorphosis, in contra-distinction to mere pathological alterations) and of the teachings they convey. He comes to the conclusion that these are a much safer guide than the microscopic study of the genesis of the organs, which has often misled those who too implicitly relied on its teachings. Investigating the anamorphoses of the Norway spruce, he finds the two lateral carpellary leaves distinctly indicated and more or less separated and developed. In more involved cases an anterior and then a posterior bract make their appearance; these, Professor Eichler had taken for a third and fourth lobe of his ligula. It must be stated here that normally the posterior bract is the third and the anterior the fourth in order. Celakovsky comes to the conclusion that, at least in *Abietineæ*, Eichler's theory (that the carpellary scale is a mere emergence or ligule of the bract) is quite wrong, and that Mohl's view (1871)*—that the carpellary scale of these plants consists of the two connate lowest leaves of an axillary, otherwise undeveloped, bud connate at their upper edge and producing the ovules on their back,— is amply vindicated by all known morphological facts and is antagonistic to none of them.

He further concedes that the same explanation may possibly be the true one for all conifers, and that all morphologists who have treated this question thus far, have, whatever their views, assumed a conformity in this respect in all the tribes of conifers, and a complete homology of their female organs. But he thinks

* It appears now that A. Braun has expressed the same view as early as 1842 in the French *Congres scientifique* at Strasburg, in the report of whose proceedings it is published. He often threw out such hints from the rich treasures of his investigations, but with characteristic modesty he gave them to science without urging them or claiming scientific property or priority in them.

that this is not necessarily so, and that Sachs' and Eichler's emergence or ligular theory may be true as to *Araucarieæ*, and that thus the cone of these plants is really and truly a single flower. In regard to *Taxodineæ* and *Cupressineæ* he is convinced that an inner fruit scale really exists, completely adnate to the bract and soon outgrowing it, but he does not venture to pronounce on its nature, because he thus far has no ocular demonstration of it through any anamorphosis.† Professor Celakovsky concludes that the arillus of *Taxaceæ* corresponds with the ligula of *Araucarieæ*. He speaks of the *terminal* position of the ovule in this tribe as of very little morphological importance, being really a lateral ovule pushed to the top of an axis.‡

It will be of interest to those who have been misled by contrary statements, to learn that O. Heer, the celebrated phyto-paleontologist, has shown that geologically *Abietineæ* and *Taxodineæ* are the oldest conifers now known, appearing already in the Carboniferous period, while *Araucarieæ* come up much later in the Trias and Jurassic formations. But relative geological age of the different tribes of plants is of much less importance for the appreciation of their degree of development and their position in the system than some suppose. Thus the *Cycadeæ*, the Phænogams most closely allied to the vascular cryptogams, are, as Professor Heer states, very uncertain in the Carboniferous, and make their decided appearance first in the Permian rocks; therefore much later than the higher developed conifers.—G. E. *in Am. Jour. Sci.*

Limits of Michigan Plants.—The distribution of plants along the Great Lakes is a subject of much interest. The equalizing influence of the Lakes upon the climate of Michigan and adjacent states has resulted apparently in bringing together the two extremes of the floras considerably north and south of them. The mild winters allow southern species to come in, while the cool summers are favorable to the growth of more northern species.

† The writer of this is in posession of a proliferous cone of *Sequoia gigantea* which seems to prove, not only that the fruit scale in this species (and consequently in the whole tribe) is homolgous with that of *Abietineæ*, in so far as it consists of leaves of an axillary shoot, yet that these leaves are not a single pair, but, as A. Braun has long ago suggested, in regard to *Cupressineæ*, that there is a number of leaves, laterally coordinate and connate, bearing a number of ovules on their back.

‡ It might be well to draw attention to the singular fact, that in the allied gymnospermous family of *Gnetaceæ*, the female flower (for such it is now assumed to be, the outer integument or utricle being considered as a two-leafed carpel) is always referred to as "terminal," whether single, double or triple, while a terminal organ can not be otherwise than single. The fact is that the female flowers are here axillary in the axils of one or more of the uppermost bracts, and, if single, are pushed to the top of the shoot.

This condition of things is seen especially along the east shore of Lake Michigan. The mild climate of this long strip of country bordering the lake renders profitable the growing of tender fruits, and has caused this "Fruit-belt" of Michigan to become widely known. The Fruit-belt is not only peculiar in its great production of peaches and berries but also to a certain extent in its botanical characteristics. Many species of plants seem to find the extreme limit of their range north or south in this belt. The following species are among those which appear to reach their limits at South Haven, Mich., fifty miles from the head of the Lake. Of course the limits as given here are only approximate, for north of South Haven there has been no complete work done on the lake shore. The interior of the state has been well studied however by C. F. Wheeler, E. F. Smith, and others, whose work is given in Wheeler & Smith's admirable catalogue of Michigan plants. For the south the GAZETTE's Indiana catalogue is often consulted.

Lycopodium complanatum, L., grows rarely at South Haven in old choppings. It evidently reaches its southern limits about the head of the Lake in Indiana. (*Ind. Cat.*)

Botrychium ternatum, Swtz., var. *dissectum*, Eaton, seems to reach its northern limits here, but var. *obliquum*, Eaton, extends farther north into the center of the state. These are not reported north of Southern Indiana in the Indiana catalogue, and do not occur in Wisconsin, according to G. D. Swezey's list.

Woodwardia angustifolia, Sm., occurs in very restricted quantity in a dense hemlock wood, along with *Goodyera repens* R. Br., *Chimaphila maculata*, Ph., *Chrysosplenium Americanum*, Schw., and the commoner *Lycopodiums*. This beautiful fern will soon disappear—as soon as the forests are removed. It is probably a survivor of the extensive swamps which once covered the state.

Phegopteris Dryopteris, Fee, occurs sparingly (*Mrs. Millington*). This is undoubtedly its southern limit in the West.

Stipa avenacea, L., and *Vilfa vaginaeflora*, Torr., seem to reach their northern limits here, although the latter occurs sparingly as far north as Lansing.

Juncus scirpoides, Lam., approaches its northern limit while *J. articulatus*, L., reaches its southern. *J. nodosus*, L., var. *megacephalus*, Torr., strays north along the shore, and occurs in the center of the state in Montcalm County (*Wheeler & Smith's Cat.*) *Clintonia borealis*, Raf., reaches its southern range at South Haven. The same is nearly true of *Cypripedium acaule*, Ait., which is rare at this point. It is reported from one locality in Northern Indiana.

Goodyera repens, R. Br., reaches about its southern limit here.

Potamogeton perfoliatus, L., var. *lanceolatus*, Robbins, occurs here, and northward to Petoskey (*C. F. Wheeler*).

Pinus Strobus, L., reaches its southern limit in the center of the state at Mason, near Lansing. It follows the Michigan Lake shore down into Indiana however. *P. Banksiana*, Lam., is common on light land as far south as the middle of the lower peninsula, and is then not known to occur again till we reach the head of the Lake, where it is quite abundant. It there reaches its southern limits.

Tsuga Canadensis, Carr., the hemlock spruce, reaches about its southern limits here, where it is the leading forest tree. It does not occur in Indiana.

Betula lutea, Mx. f., approaches its southern limits here. *B. papyracea*, Ait., occurs near the head of the Lake (*E. J. Hill*), probably its extreme southern limit.

Calamintha Clinopodium, Benth., also reaches its southern limits here. It is undoubtedly indigenous. ("Indigenous about the upper Great Lakes and elsewhere"—Gray's Man.)

Chimaphila maculata, Ph., approaches its northern limits at South Haven, although it occurs sparingly as far north as Ionia. (*Wheeler & Smith's Cat.*)

Vaccinium vacillans, Sol., the principal dry-land blue-berry of the upper Lake region, occurs occasionally as far south as the central part of Indiana (*Ind. Cat*). At South Haven it is the leading upland berry, from this point it seems to dwindle away to the south.

Artemisia Canadensis, Mx., probably follows the shores of the Lake generally. It occurs here in great abundance, and at the head of the Lake (*E. J. Hill*), probably its southern range.

Solidago Virga-aurea, L., var. *humilis*, Gray, follows the Lake shore southward to this place. It is not known to occur farther south.

Cornus Canadensis, L., occurs in abundance, and strays as far south as central Indiana (*Ind. Cat.*), apparently far beyond its usual range.

Aralia hispida, Mx., reaches its southern limit in the West at South Haven where it is abundant. *A. quinquefolia* Decs. & Planch., also occurs, but is very rare.

Opuntia Rafinesquii, Englm., seems to prefer the sheltered interior to the Lake shores. It occurs as far north as the center of the lower peninsula (*Wheeler & Smith's Cat*).

Prunus Pennsylvanica, L., approaches its southern limits here, while *P. serotina*, Ehr., takes its place, and begins to approach its northern limits, although it occurs considerably farther north toward the center of the state.

Phaseolus diversifolius, Pers., probably reaches here, its northern limits as also *Linum Virginianum*, L.

Hibiscus Moscheutos, L., occurs here, the only known locality in Western Michigan. It also occurs near the head of the Lake in Indiana (*E. J. Hill*), and at Put-in-Bay, Lake Erie (*Wheeler & Smith*). It probably follows near the lower Great Lakes generally.

Hypericum pyramidatum, Ait., occurs but is very rare. Its range seems to be north.

Other lists of Michigan Lake Shore plants were published in the GAZETTE for July and August, 1880, and from Rev. E. J. Hill in Sept. 1881.—L. H. BAILEY, Jr.

Notes from Mount LaFayette, N. H.—I have been spending the summer in Franconia, N. H. While there I collected extensively both in the valley and the mountains. Moreover, I undertook to keep a list of all plants which I recognized in passing over the roads, either on foot or when driving. I am now tabulating results and find them quite interesting, as much for the conspicuous deficiencies in certain common genera, as in the presence of unusual species.

I spent one day on Mount LaFayette, something over 5,000 feet in altitude, and collected many alpines in the short time allowed on the summit. It may interest those who live in lowlands to read the names even of these fascinating boreal species. I did not pay much attention to the plants of the lower part of the mountain, except to note their change of fo.m as I ascended. *Solidago thyrsoidea*, E. Meyer, was in its glory, and I think as handsome as the sea-side *S. sempervirens*, L. It grew several feet in height, up to an altitude of over 4,000 feet, intruding even into the peculiar dwarf forest of that region. Here I began to find *Vaccinium Vitis-Idæa*, L., in fruit (Aug. 10th). *Chiogenes hispidula*, Torr. & Gr., was very abundant, also fruiting.

After leaving the dwarf forest the path became very rough with loose, jagged stones, and there were no trees except the flat and spreading *Salix Cutleri*, Tuck. Here I began to find the peculiar alpine sedges, *Carex rigida*, Good., etc.; *Poa laxa*, Haenke, *Hierochloa borealis* Roem. & Sch., and *Aira atropurpurea*, Wahl. The most conspicuous flower by all odds was the tufted and showy *Arenaria Grœnlandica*, Fenzl., which bears here the curious local name of "mountain daisy." An unfortunate misnomer! I found large bunches of *Diapensia Lapponica*, L., in fruit, but missed my old friends *Cassiope hypnoides*, Don., and *Phyllodoce taxifolia*, Salisb., so charming on Mt. Washington. The pretty *Loiseleuria procumbens*, Desv., was in fruit. I had the good fortune to find *Geum radiatum*, Michx, var. *Peckii*, Gr., in splendid shape and very abundant, as was also the dwarf golden-rod, *Solidago Virga-aurea*, L., var. *alpina*, Bigel. I collected large quantities of this and of

Nabalus nanus, DC. My other finds so far determined were *Juncus trifidus*, L., *Scirpus cæspitosus*, L., and *Lycopodium Selago*, L. I looked longingly down upon the little "Lake of the Clouds," bestudded with yellow pond lilies, but there was not time to explore it. I have no doubt that an hour would have revealed many other precious things. As it was, I collected between bites of my luncheon and in a high wind. And here let me put in a plea for the much berated *vasculum*. I brought back my specimens fresh and unrumpled which were afterwards carefully pressed by my wife. She agrees with me in the conviction that with a portfolio we would have spoiled half of them. A frisky mountain breeze hardly allows of the manipulation of papers. With a box, too, one can collect more rapidly.

I was much interested in the intrusion of low valley plants into high regions. *Veratrum viride*, Ait., grew at an altitude of over 3,000 feet above the sea with unusual vigor, though it appeared to be sterile. On the very summit of the mountain, mingled with the alpine vegetation, grew *Spiræa salicifolia*, L., and *Thalictrum Cornuti*, L. What was not so strange, *Ledum latifolium*, Ait., approached nearly to the summit.

I shall not soon forget my day of alpine botanizing, with all New England mapped out at my feet.—W. W. BAILEY, *Brown University*.

Immigrants.—It is important to note the arrival of recent immigrants which are either indigenous to this country, or are naturalized from abroad. It is an important auxiliary to the study of plant distribution. The following, not mentioned in our manuals, are naturalized in Michigan:

Dianthus furcatus, Balb., abundantly naturalized on the extensive grounds of the Agricultural College, Lansing; also at South Haven. This is a pretty perennial with red flowers ¾ inch in diameter. It forms dense mats on lawns and old pastures, its furcate stems ascending about a foot high. Petals crenate, dotted with white; calyx bracts awl pointed, ½ the length of the calyx tube. A native of Northern Italy. *D. Armeria*, L., occurs at Lansing, and E. F. Smith reports it from Clinton county.

A form of *Cerastium arvense*, is thoroughly established on the College grounds. It is evidently var. *Andrewsii*, Syme., described by Hooker as having "leaves rigid, glabrescent, midrib strong below, flowers subsolitary." It forms dense mats which, when closely mowed, are hardly distinguishable from the sod. Flowers often ¾ inch in diameter, pretty.

Tragopogon pratensis, L., the English Goat's Beard, occurs at South Haven and Irving, Barry Co. Mr. F. H. Tuthill reports it from Kalamazoo, and C. F. Wheeler from Hubbarston, Ionia Co.

It is distinguished from Salsify, *T. porrifolius*, chiefly by its yellow flowers. The root is edible.

Crepis virens, L., occurs on the College grounds, Lansing, where it has flourished for at least three years. It is a very ordinary looking composite of the suborder Ligulifloræ, specifically characterized as follows: "Glabrous below, lower leaves toothed runcinate or lyrate, upper linear sagittate, inner bracts glabrous within, as long as the pappus, in one row. Waste and cultivated ground, cottage roofs, etc. Fls. yellow, June–Sept. Annual, very variable. Stems 1–3 ft, furrowed, much branched; inflorescens usually glandular hairy. Heads ¼–¾ in. diam., campanulate; outer bracts subulate, inner linear. Fruit red-brown, ribs 10 or more, smooth."—*Hooker*, *Stud. Fl.*

Veronica Chamædrys, L., the Germander Speedwell of England, is common on the College grounds along with *V. officinalis* and *Thymus Serpyllum*, all of which are thoroughly established. Hooker describes it as "hairy, stem pubescent on opposite sides, leaves subsessile, ovate–cordate, deeply serrate, pedicels slender, axillary, raceme long, lax; capsule obcordate, shorter than the calyx; fls. blue."

Polygonum Hartwrightii, Gray, is reported from Kalamazoo. For note and description see Gazette for February, 1876.

Amarantus blitoides, Watson, occurs on the beach of Lake Michigan at South Haven. This peculiar amaranth has very much the appearance of purslane at a little distance. It was first detected as a distinct species by Dr. Bessey who sent specimens from Iowa to Prof. Watson. It was at first thought to be a variety of *A. albus* and was later mistaken for *A. blitum* of Europe. Mr. H. N. Patterson, of Oquawka, Ill., kindly furnishes the following description and notes:

Amarantus (Pyxidium) *blitoides*, S. Watson. (Proc. Am. Acad. XII, 273, 1876.) Prostrate or decumbent, the slender stems becoming a foot or two long, glabrous or nearly so; leaves broadly spatulate to narrowly oblanceolate, attenuate to a slender petiole, an inch long or usually less; flowers in small contracted axillary spikelets; bracts nearly equal, ovate-oblong, shortly acuminate, 1 to 1½ lines long, little exceeding the oblong, obtuse and mucronulate or acute sepals; utricle not rugose, slightly longer than the sepals; seed nearly a line broad. Frequent in the valleys and plains of the interior from Mexico to Northern Nevada and Iowa, and becoming introduced in some of the Northern States eastward. Mr. Patterson adds: "It grows all through Northern Illinois, especially along railroads. I think it is not truly indigenous in this state, but has come in lately."—L. H. Bailey, Jr., *Lansing, Mich.*

Malvastrum angustum, Gray.—Has any botanist ever observed cleistogamy in this plant? While exploring a tract of high rocky ground east of this place the sixth of July, I discovered some twenty specimens of this rare species, most all of which bore seed on the lower branches. But as there were buds not yet expanded upon the top and upper branches, I deferred collecting until the next day, supposing the buds would open and the petals expand. But day after day went by, and as the carpels commenced to form, the corolla withered and remained upon the top of the carpels. Upon being wetted, the petals showed no signs of having dehisced.

Owing to scant material I cannot be sure that my observations were of any worth.

If any other collector can enlighten me on this point I will be very thankful.

From the simple fact that all of my exchanges have only fruited specimens, I would infer that they have never seen the flowers.—Frank Bush, *Independence, Mo.*

Some Notes on Physostegia Virginiana.—An idle hour on the prairie lands of Northern Indiana brought me face to face with acres of this beautiful "False Dragon-head," in full bloom, and I wondered what could be learned of its life in such a causal interview. Nothing can be more graceful than its spikes of rose-colored flowers, but the great variability of its leaves showed what a puzzle to the amateur botanist some of the extreme forms would be, if isolated. In many cases the leaves were very small, linear, and entire. But very soon a new feature attracted me with all the interest of a discovery, for in some way I had never associated it with *Physostegia*. The flowers were strikingly cataleptic, for the slightest touch upon one would push it from its normal position and there it would stay; and so it could be turned indefinitely upon its pedicel, standing quietly in any position within the range of more than half a circle. All the flowers of a thick cluster can thus be thrown toward any side of the stem. A consultation of Gray's Fl. N. Am. shows that this character is attributed to the whole genus. Its object was suggested by seeing a very natural result of this mechanism. A slight breeze, accompanied by a dash of rain, suddenly sprang up, and every flower veered about, like a most sensitive weather-vane, leaving only the back exposed to the wind and rain. The horizontal position of the flowers and their widely opened tubes would have permitted half of them to be filled with water had they not so quickly shifted their direction.

This observation led to a thought as to the method of securing cross-fertilization in this species. The long style rises among the four stamens along the upper part of the swollen tube, being attached to it by an entanglement of hairs, the stigma lying close

against the arching upper lip, while the stamens bend forward and are introrse. The mouth of the tube is so large, that no insects smaller than the humble bees could have touched the pollen, and numbers of them were observed busily at work. The pollen was so ripe and the stigmas apparently so immature, that it looked suspiciously like a case of proterandry, but as only the one condition could be found, this was left as a mere suspicion. Perhaps other observers have decided it.

But for a fine illustration of cataleptic flowers let me commend *Physostegia* to our teaching botanists.—J. M. C.

Mimulus dentatus, Nutt.—Having until recently only a solitary incomplete specimen of this, of Nuttall's collection, I referred it with some doubt to the *M. luteus*, var. *alpinus*, in the Synoptical Flora. But in June last, Mr. Rattan found a plant, exactly like Nuttall's, in Northern California, in the forests of Humboldt and Del Norte counties, where it abounds. It is a good species, which should stand, as I have stated, between *M. luteus*, var. *alpinus* and *M. moschatus*, var. *longiflorus*, the calyx rather that of the latter, and quite unlike that of the former. But now Mrs. Austin sends from Lassan's Peak, a var. *gracilis* of the same, smaller in all its parts, with leaves rather denticulate than dentate, and still more approaching the long-flowered form of *M. moschatus*, but almost glabrous.—A. GRAY.

Linnæa borealis is found by Mrs. Anthony, of Gouverneur, New York, occasionally to produce 3-flowered and 4-flowered peduncles. In the four flowered specimens sent to us the axis of the peduncle is continued beyond the fork for a short distance, and then bears the additional pair of pedicels. Attention being thus called to it, I find 4-flowered specimens in our herbarium, collected long ago by the late Mr. Oakes.—A. GRAY.

Teratological Note.—I found a flower of *Lathyrus palustris*, L., having the ovary divided as far as the middle, having a style for each division. There were 14 stamens, one of which occupied the usual position above the ovary while the rest were united; but the free end of the filaments were separated into two lots, one of 7 and another of 6 to occupy respectively two keels perfect in shape and distinct from one another. On the outer side of either keel were attached slightly the two wings. The standard was very broad. The calyx had the usual two small upper teeth, but there were five instead of three longer teeth beneath. Those who have studied this flower know that both sides of the keel are incurved thus retaining the stamens while the hairy surface on the inner side of the flat style carries out the pollen, at the same time giving to and receiving from the insects the pollen necessary for cross-fertilization. All these arrangements were left uninjured by the strange multiplication of parts.—A. F. FOERSTE, *Dayton, O.*

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Editorial.—The types made some annoying blunders in our last number. On page 94 Dr. Gray is made to say that he "will" remember the satisfaction he had, instead of "well" remember, and on page 100 Mr. Ward talks of "Proterogyn."

The study of the low forms of plant life is beginning to attract more and more attention. Nothing can be more easily observed, or is more unknown than the simplest of plants. The cheapening of good microscopes and the multiplication of necessary books and figures will soon bring crowds of students to this field.

There have been added to the Catalogue of Indiana Plants during the past season such plants as *Baptisia tinctoria*, growing throughout the Kankakee Valley, and in the bogs of the same region *Habenaria leucophœa*, growing quite abundantly. *Osmunda Claytoniana* was found growing very luxuriantly in Pulaski County, with sterile and fertile pinnæ growing hit and miss up and down the huge fronds as well as in the normal fashion.

At Montreal Dr. Louis Elsberg, of New York, read a paper proposing what was called the "bioplasson theory," as opposed to the "cell theory," for plant-structure. According to this observer all living matter is made up of reticulations of living substance with inert matter filling the reticulum. Besides the fact that it is a little late to call in question a theory which has about ceased to be theoretical, the fact that many of the best microscopists fail to find this living net-work renders the proposed theory a little unsubstantial.

The Buffalo Society of Natural Sciences has just issued the first part of a Catalogue of the "Plants of Buffalo and its Vicinity," including the Phanerogams. The compiler is David F. Day, Esq., and the thoroughness and beauty of the work reflect great credit upon him and the Society which publishes it. The Catalogue is accompanied by a good map of the region studied which includes all the country within a radius of fifty miles of Buffalo, and has been divided into several regions, known as the "Erie District," "Allegany District," "Genesee District," and "Ontario District." When completed the catalogue will contain the names of 2800 species and what is unusual in plant catalogues will include the Cryptogams. The Phanerogams number 1217 species, the 10

largest orders being *Compositæ* (143 species), *Cyperaceæ* (105), *Gramineæ* (88), *Rosaceæ* (52), *Leguminosæ* (45), *Menthaceæ* (which name looks unnatural –39), *Ranunculaceæ* (36), *Cruciferæ* (36), *Orchidaceæ* (34), and *Liliaceæ* (31). The largest genera are *Carex* (72 species), *Solidago* (20), *Aster* (19), *Polygonum* (16), *Salix* (14), *Potamogeton* (12), *Viola* (11), *Habenaria* (10).

The Timber Line.—In Dr. Rothrock's valuable report on botany, recently published by the "Surveys West of the 100th Meridian," the author quotes Dr. Englemann's statement that "there is little or no increase in altitude in the timber line toward the equator, in our western hemisphere, south of the 41st parallel of north latitude."

This statement is approximately true regarding the Rocky Mountains, owing, however, not to any general principle, but to what may be termed an accident of topography. Even here a decided rise is observable from 41° to 39° of latitude. In the Sierra Nevada, the Basin and Wahsatch Ranges, the statement does not hold good, the timber line rising rapidly as the latitude decreases. Again, on the volcanic peaks of the Mexican plateau, the timber line is higher by several thousands of feet than it is anywhere in the United States.

Barring the prohibitive circumstances of absence of soil and moisture, the height of the timber line is purely a question of temperature. The latter is a function of the latitude, the elevation, and the mass, of the country in the neighborhood. A great mass of country, if raised to a considerable height above the sea, as in the case of the great Cordilleran plateau of the West, carries up with it, to a certain extent, the isothermals A glance at Mr. Schott's admirable isothermal charts amply illustrates the general fact. Washington, D. C., has a mean annual temperature of 55° Fah., while Denver, Col., a fraction of a degree farther north, and at an elevation of 5,300 feet, has a mean temperature, not of 37°, as the height might indicate, but of 49°.

Therefore, in considering the height of the timber line, we must regard the mountain ranges in connection with the plateau upon which they stand, their latitudes, heights, and masses, or what, in a measure, sums up these three, their temperatures, as it is by these that its height is determined.

Looking at the subject from this point of view, a fair comparison may be instituted between the timber line in different latitudes and on different ranges in the same latitude.

The actual elevation above the sea level of the timber line in the Cordilleras of North America ranges from 6 or 7,000 to 12,000 feet. It is lower in the Coast and Cascade Ranges of Washington Territory, where it is at about the former figures. Following the Cascade Range southward into Oregon, the timber line rises to a

height of 7,000 to 8,000 feet. It continues to rise as we trace it southward into California, being on Shasta and the neighboring mountains 8,000 feet above the sea. On the high sierras of Eastern-central California, forests grow to 10,000 or 11,000 feet, while the San Bernardino and other ranges of Southern California do not reach the upper limit of forests.

Few of the ranges of Nevada reach the timber line, which is at a height of 9,000 feet in the north up to, probably 11,000 feet in the southern part of the State.

In Arizona, probably none of the mountains reach the timber line, except the volcanic group known as the San Francisco Mountains, and the Sierra Blanca. On these the timber line is between 11,000 and 12,000 feet.

In New Mexico, it averages about 12,000 feet above sea level. There is little variation between the northern and southern parts of the territory, as the higher annual temperature of the southern part is fully compensated for by the greater altitude of the plateau in the northern part.

In Colorado, it ranges from 12,000 feet in the southern part to 11,000 in the north. It is highest in the great mass of the San Juan Mountains and in the Sangre de Cristo range, and lower in the northern portions of the Park and Front Ranges.

In Southern Wyoming, in the Park range, which is the only one in this portion of the territory which rises above the limit of timber, this limit is at about 11,000 feet. In the Wind River and Teton Ranges, in the northwestern part of the territory, it is at an elevation of 10,000 to 11,000 feet.

In Montana and Idaho, the limit of timber is, in general, from 9,000 to 10,000 feet, being highest in the south, and lowest near the northern boundary.

In the Uinta and Wahsatch Ranges of Utah, it is about 10,000 feet rising somewhat above this figure in the southern part of the latter range.

Thus it is seen that in the same latitude, there is a very marked difference in the height of the timber line. The less the elevation of the surrounding country, other things being equal, the lower is the limit of timber.

This suggests a farther point. The upper limit of timber must have approximately the same mean annual temperature everywhere. Of course it will differ to a slight extent in different localities, owing to difference of exposure to wind and sun, but these are mere local circumstances, not effecting the general principle. The determination of this temperature accurately is, without direct observation, of course, impossible. I have, however, computed it approximately from such data as are available, and have found tolerably close accordance among the results.

The mean annual temperature decreases about 1° Fah. for each 300 feet of abrupt ascent. In the case of Pike's Peak and

Colorado Springs, where the difference of elevation is more than 8,000 feet, the change is 1° for each 295 feet. In the case of Mt. Washington and Shelburne, New Hampshire, it is 325 feet for each degree. The former case is the most favorable in every respect, and as most of our results are drawn from the western region, I have adopted, as a round number, 300 feet.

Now, if the average mean annual temperature all around the base of a mountain were known, it would be a very simple matter to determine, with some accuracy, the temperature at timber line, knowing its height and the mean height of its base. The nearest approach which can be made to this, is to assume that the station or stations at or near the base, represent the average climate, a supposition which, in many cases, is by no means correct. Using, however, in the manner indicated, such data as are at hand, I have obtained the following results:

Mountains, etc.	Height of timber line, feet.	BASE STATION.			Temperature at timber line.
		Name.	Height in feet.	Mean an. tem.	
Cunningham Pass, Colo..	11,500	Fort Garland,	7,945	43deg	31deg
Mt. Lincoln, Colo.,	12,051	Fairplay,	9,965	38 "	31 "
Mt. Silverheels, Colo.,	11,549	"	9,965	38 "	33 "
Mt Guyot, Colo.,	11,811	"	9,965	38 "	32 "
Mt. Powell, Colo.,	11,600	White River Agency,	9,491	45 "	28 "
Pike's Peak, Colo.,	11,720	Colorado Springs,	6,032	48 "	29 "
Gray's Peak, Colo,	11,100	Denver,	5,244	48 "	29 "
Wahstach Mts., Utah,	10,000	Salt Lake City,	4,350	52 "	33 "
Mt. Washington, N. H.,	4,150	Shelburne, N. H.,	700	42 "	30 "
Mt. Marcy, N. Y,	4,851	Somerville, N. Y.,	412	45 "	30 "
" "	4,851	Plattsburgh, N. Y.,	180	44 "	29 "
Mt. Blackmore, Mont,	9,550	Fort Ellis, Mont.,	4,935	44 "	29 "
Mt. Bridger, Mont.,	9,002	" "	4,935	44 "	31 "
Mt Delano, Mont.,	8,784	" "	4,935	44 "	31 "

The mean of these results is 30.4°, and this is probably very near the true mean annual temperature of the timber line. The better the conditions of the determination, the nearer are the results to this mean. Mts. Blackmore and Bridger are very good cases, being on the border of the Gallatin Valley, in which Fort Ellis is situated, and but very few miles distant from the latter. Mts. Lincoln and Silverheels are also admirably situated with respect to Fairplay, but the annual temperature of the latter station is not well determined. Pike's Peak and Colorado Springs make an excellent pair of stations, being but ten miles apart, and the annual temperature at the latter place being well determined by the observations of the Signal Bureau. On the other hand, Mt. Powell and the White River Agency are widely separated by many miles of high plateaus, which may materially change the conditions of the temperature about the mountain.

Should this result, when tested by a wider range of observation, hold good, it will afford a very valuable and easily obtainable isothermal, and also enable one to estimate the height of the timber line from thermometric stations at the bases of mountain ranges. —HENRY GANNETT in *Am. Jour. Sci.*

A Colossal Album of Living Ferns, by J. G. Lemmon.—Explorers in mountainous countries sometimes encounter what the frontier's-men call "rock-traps"; if on the Pacific coast, "box-canyons."

Generally terminating a ravine, and with high precipitous walls on either hand, they bar farther ascent, and the explorer has no choice but to retreat.

If, however, the party is a lover of Nature he is apt to pause and examine these *cul-de-sacs* with more or less of interest and profit. These box-canyons sometimes may be likened to immense half-opened books, resting on end and slightly inclined against a mountain.

Occasionally a tier of them may be found encircling the top of a mountain like a revolving book-rack in a reference library. In these ponderous tomes of Nature's original scriptures what solid, fundamental, pre-historic facts may be read by the educated mind. The geologist is sure to discover remarkable placements of rock-strata, or the no less interesting omission of normal relations. The paleontologist may discover shells, casts of fossil parts of animals and plants as he shatters the rocks with his hammer.

If in a reputed region of the precious metals, the first to explore minutely, these open volumes, is the eager, intrepid prospector, gladly availing himself of the chance to examine without the aid of pick and shovel, the exposed rocks to trace, if any there be, the indications of ore. The zoologist will often find rare insects, reptiles, birds or beasts haunting these secluded places.

But if a stream of water cascades down the chasm or even if enough trickles over the walls to keep the interstices moist, the botanist, more than all others, will be certain to find much of interest in the peculiar flora which these conditions always produce.

It is such a secluded, magnificent and well-watered natural conservatory, like a colossal album of living plants, that the writer discovered last week, here in the heart of the lofty, rock-ribbed, heavily-forested Huachuca mountains of southern Arizona. The results of the adventure may justify a detailed description.

It was about 11 A. M. of a hot August day, when as I turned an angle of a deep ravine, a stupendous gorge opened before me not 20 rods distant, its dark, vertical walls over 2,000 feet high, seamed and furrowed laterally and vertically; these containing rank on rank of plants of various size and hue, while over all water dripped in a shower of pearls.

The grandeur of the scene fixed me to the spot for a moment

How magnificently the rock-ledges up-rose on either hand! Granite, gneiss, porphyry, feldspar, trap, quartz, limestone, syenite and slate were superposed in varied degrees of thickness and projection, all tinted with their characteristic colors and decked off with wreaths of superb flowers.

As I neared the open volume I detected irregularities of the sides as if the pages were crumpled or plaited. Nearing the entrance the right-hand page was found to be composed of a long series of upright divisions all hinged together by vertical depressions like a segmented panorama or series of pictures which one folds between covers for safe transportation; the left-hand page had fewer but grander swelling folds and all were richly decorated with flowers and ferns many of which I had never seen before. How charming was this nearer view! For vignettes on the lower margin of the pages there is, on the right a row of lovely maples just now shedding their double-oared seeds; on the left, a row of thrifty walnut trees bending with yellowing fruit.

Penetrating to the inner angle of the enclosure where all the water pearls unite to form a rivulet I scanned the almost vertical walls to determine if they could be scaled. The discovery in the first horizontal fissure of a rare and beautiful fern (*Aspidium juglandifolium*) that has not before been found west of Texas, decided me to make the attempt, even if I had to return to camp for ropes and let down a knotted one from the top the next day. But excited by the prospects ahead I hastily divested myself of all weight possible, but retaining portfolio and pick, I assaulted the rock-barriers. Slight projections occurred at long intervals, cavities were dug in the soft sandstone for fingers, then toes. while fortunately, over the thickest ledges of jutting rocks such bushes as dwarf oak and evergreen sumac often trailed their branches within reach.

Gaining the second landing a new flower was discovered and another rare shield-fern (species unknown). With increased toil and peril the third narrow bench was reached at an elevation of about 100 feet. Two more ferns—one of them new (a *Cheilanthes*)—with several other novelties were found peeping out from the clefts as if to welcome the intruder and invite his gathering hand.

How much these discoveries stimulated to continued efforts, and blinded the judgment to probable disastrous consequences I leave my young botanical brothers to imagine. At the next resting place which was a little wider ledge than the preceding, I was well nigh exhausted and was perspiring profusely, but before I had an opportunity to settle myself on a narrow seat another most beautiful and rare fern was detected! It was now long after noon and as this vast conservatory was on the east side of the mountain the sun was hidden and the cold descending winds chilled me to shivering.

But other rare or even new ferns might be awaiting, besides

now, perhaps it was easier clambering out over the top than to return. At about half way up, say 1000 feet altitude a ledge of two to six feet wide occurs, and here hundreds of species of shrubs, herbs, ferns, mosses and lichens crowd the broadened bench in a most robust form and highest colors. A lovely, motley-leaved plant (*Heuchera sanguinea*) resembling a geranium thrusts long racemes of bright red, star flowers from the crevices. A golden *Silene* (*S. laciniata*) with large lacerated petals and a curious *Draba* (*D. streptocarpa*) with yellow flowers and curled pods cling to the damp wall. Dr. Parry's new and beautiful lily vies with the golden columbine in flaunting a profusion of rich color. White-faced strangers with purple Lobelias commingle their lives, while beneath all, a noble shield-fern, a modest lip-fern, and a delicate spleen-wort—all new to the region—formed an exhilarating climax to discovery, aud rendered the toiler totally irresponsible.

Above this ledge the walls are deeper, the foot-holes and trailing bushes less frequent, so progress became more difficult and dangerous. But the strange plants still appeared at every cleft. At about 4 o'clock P. M. I had arrived near to the top and felt triumphant and elated. Already I regarded myself safe and recalled the number of ferns crammed into my portfolio which now weighed about 15 pouuds and was securely strapped to my back. There were twenty-seven species and several very marked varieties! When it is considered that only 80 species are yet known to science in all N. America, to find one-third of the number growing in one rocky album, however large, is enough to turn an ambitious botanist's head.

Tired, bruised, exhausted and shivering I drew myself slowly up to the last crevice, to be amazed and stunned at seeing the uppermost stratum which was of slate and about 50 feet thick jutted out 1 to 5 feet over the wall on either hand.

There was no recourse but to return. How frightful was the yawning chasm now that I had to face it! How tremulous were my bending knees! Experienced cragsmen the world over will tell you that it is far easier to climb up than to descend a wall of rocks. You cannot see the foot-holds or avail yourself of bushes when they are below you.

Once the slight projection that half-received my nailed boot proved a thin shell of rock and I fell ten feet to the next ledge, landing on my shoulders; my outspread arms luckily clutched a spiny bush on one side, and a prickly cactus on the other, else I would have fallen over 1,500 feet. This accident banished the ferns for the nonce from consideration and determined me to seek an exit from the trap by a side passage if such could be found. Side stepping with great care along on each ledge as far as possible before returning to the center I examined each of them in order but with no success until the broadest ledge about half way down was reached. Here on the left, the ledge extended like a bridle

trail across the folds of the panorama described, in long, swinging curves in and out. It was often blocked up by debris or guarded by cactus or thorn bushes, but over or through these I struggled, passing fold after fold of the long series; a sheer precipice of 1,000 feet below, an equally high and steep one over head, the way often narrowed to a foot in width and in several places, seemingly impassable. In the desperate straits when the carrying of my heavy portfolio before me almost tipped me over, I was tempted to cast it away or at least to leave it in the path until refreshed by food and rest another day.

But this recreancy was but momentary, and now clutching the bundle tightly I would have fallen rather than relinquished it. At last with torn garments and lacerated flesh, with tottering steps and dizzy brain, obstacle after obstacle was surmounted and I stood —or rather fell forward—upon *terra firma*, saved!

Reporting adventures and showing trophies to Mrs. L. at night, she was seized with uncontrollable desire to look into the wonderful fern album too. So after resting and recuperating a day I conducted her—dressed properly for the occasion—up the mountain and admitted her by the side entrance, with the aid of hatchet and pick. Stouter hearts than woman's might have quailed at the imminent perils passed, but at the narrow places she faced the wall, carefully side-stepped along several feet. and so pressed forward. At every outward curve of the long course, there is a little landing, it may be of debris, or a clear space and here she caught glimpses of the radiant treasures in the center of the volume. Nearer and clearer they grew and louder and more emphatic were her exclamations of admiration and awe.

Though the trip was toilsome, and terrifying, and though we came near being caught by an Arizona cloud-burst so-called or sudden torrent that thundered down the gorge at a moments warning, yet she highly enjoyed the adventure and declared that in all her extensive travel this natural conservatory in grandeur and beauty exceeds any one object she has seen on the Pacific slope.

Rumors of the discovery having reached Fort Huachuca, 10 miles distant, two days after an officer with his lady drove out to our camp and I led him up to the conservatory and through the private entrance.

As we rounded the folds of the rock-wall, one after another, it was refreshing to witness his enthusiasm.

He is accustomed to target-firing and to measuring heights and his estimates of distances coincide with mine in the foregoing paragraphs.

Two days ago I sought to explore another box-canyon on the south side of the mountain. It is at a much higher elevation and is twice as large every way. I found several more rare ferns, but

late in the afternoon I became entrapped, and had to chance a slide down a limestone ledge of about 12 feet. A projection caught my left hand and broke one of the metacarpal bones in the palm of the hand, with a loud snap and much pain.

And this is why, my dear readers, being confined to camp, I have found the time out of our busy life, to scribble these lines for the GAZETTE. The doubtful ferns have been forwarded to Prof. Eaton for determination, and we hope next winter to be able to send out from our herbarium in Oakland, Cal., several new ferns gathered from our Colossal Fern Album.—*Huachuca Mts., Arizona.*

Latent Vitality of Seeds.—In the current number of the *Am. Jour. Sci.* Dr. Gray gives some account of the recent experiments of Van Tieghem and G. Bonnier to ascertain the effect of different conditions on the latent vitality of seed. Several packets of seeds, in January, 1880, were divided into three equal parts and placed under the following conditions: One was exposed to free air but screened from dust; another in closed air, being tightly corked up in a tube; the third in pure carbonic acid. At the end of two years the seeds were taken out, weighed and sown. The seeds exposed to free air had gained in weight; those in closed air had gained a very little; while those in carbonic acid gas hardly varied from their original weight. In regard to their germination, over 90 per cent. of the peas and beans kept in the free air germinated; 45 per cent. of the peas and only 2 per cent. of the beans kept in closed air germinated; while of those exposed to carbonic acid gas not one showed any vitality. In conclusion Dr. Gray remarks: "If the full course of experiments gives such results, it will (we should say) be made clear, 1st, that the vegetable embryo in the seed is not strictly speaking latent, but is doing some work, however little, is keeping up a respiration, which is essential to its continued life. 2, That the life of seeds cannot be indefinitely prolonged. *Very old* seeds exposed to the air must be dead by exhaustion, and those deeply buried, by suffocation; and the numerous recorded cases of the germination of ancient seeds are more and more to be distrusted."

Trifolium hybridum, L.—This species of *Trifolium* was found growing at Montreal in August, and though perhaps not permanently established, yet deserves a place in our flora. The description of the species as given in Hooker's "Students' Flora of the British Islands," is given below, as it may be of use to identify the plant when found. It seems to be often introduced into England with the ordinary *T. repens*, and occasionally replaces it.

"*T. hybridum*, L.; almost glabrous, leaflets obovate or oblong, stipules oblong, tips triangular, heads axillary peduncled globose, pedicels elongate at length reflexed, flowers drooping, calyx-tube

campanulate gibbous, teeth subulate nearly equal unaltered in fruit."—The flowers are white with a faint rosy tinge. The peduncles are not nearly so long as the *T. repens*, with which it might by a hasty glance be confounded. It has been recorded before as found on the ballast heaps of New York City in *Bull. Torr. Bot. Club*, VI. p. 356. A careful search in other localities may result in its discovery.—Jos. F. James, *Cincinnati.*

Aralia racemosa, L.—I have lately found a specimen of this species which was so large as to deserve mention. There were four stalks springing from the root, two of them each about an inch in diameter at the base. The largest was six feet high and had some of the top broken off. The leaves were about three feet in length and the leaflets very large. The fruit hung in clusters from 15 to 18 inches in length, and the bright red of the ripe berries made it a very attractive plant. The vigorous growth of the plant was of special notice. Gray gives no size for it, but Wood says its height is from three to four feet, but in the present plant, it must have been between seven and eight before the top was broken off.—J. F. James, *Cincinnati, O.*

Notulæ Exiguæ.—I should be glad if any botanists who possess my handbook would make the necessary correction in regard to the transmission of labels. The new ruling practically excludes any label that one would care to send out, and the express companies will thrive at the expense of the Department.

Your note on the catalepsy of *Physostegia Virginiana* should contain a reference to the manner of the action. The flowers are made to assume their definite position by friction of the pedicels against the subtending bracts. Remove the bracts and they at once fall limp. This was shown me by Prof. Goodale in 1879.

Among a lot of fresh growing plants sent me last spring by Mr. Joseph Jackson of Millbury, Mass., I find a specimen of *Trillium erectum* with two vigorous flowering stalks arising from the same rootstock and with a common sheath of scales. I have a *Cypripedium acaule* in like condition.

I found the larches in Franconia, N. H., badly injured by green *larvæ* which when touched stood out from the branches like the twigs, which in color they closely resembled. Prof. Packard informs me that they have also ravaged in Maine.—W. W. Bailey, *Brown University.*

The Darwin Memorial.—No more fitting tribute can be paid to the memory of this distinguished naturalist than the Memorial proposed in the circulars sent out from the Royal Society and by the home committee of which Dr. Asa Gray is Chairman and Prof. Alexander Agassiz Treasurer. The subscription list contains the

most honorable names in Great Britain and it is especially desirable that the number of subscribers be great rather than the individual subscriptions, for in a memorial to this great epoch-maker in science should appear contributions from all those who appreciate his work or honor his memory, and their name is legion. The form which the Memorial is to take has not yet been decided, but it will probably include an endowment for a scholarship to carry on biological research. The English circular appropriately says: "though the works of CHARLES DARWIN form his best and most enduring memorial, his many friends and admirers feel that these should not be his only monument. They are desirous of handing down to posterity the likeness of a man who has done so much for the advancement of natural knowledge, possibly in the form of a statue to be erected in some public place. They wish further, if possible, to establish a Fund associated with his name, the proceeds of which will be devoted, in some way hereafter to be determined, to the furtherance of Biological Science."

In the English subscription list the amounts vary from two or three dollars to five hundred, so that any one can give, and we have no doubt that many readers of this will be glad to contribute within these limits. The home circular says that "subscriptions may be sent to Alexander Agassiz, Cambridge, Mass., who will acknowledge the same and forward them to the Treasurer of the English Executive Committee of the Darwin Memorial."—J. M. C.

Aralia racemosa, L.—This plant is well adapted to show the morphological character of a panicle. Two or three internodes from the ground is a leaf about 2½ ft. long. In its axis may be found 1 to 3 umbels. The next internode bears a leaf about 1½ ft. long. In this axis is a raceme of 4 to 7 umbels. The leaf of the following internode is only about ¾ ft. in length. It bears a panicle of 4 to 7 umbels. The succeeding leaf is ⅝ in. long, the petiole equalling the ternately parted rudimentary blade. The axis contains 3 to 4 umbels in a panicle. Then follow two or three leaves scarcely ¼ in. long with undivided blades passing into triangular bracts. This is the normal condition, but intermediate states are found connecting the leaves morphologically with the bracts by a continuous series of specimens. What seems to be a large panicle is the primary stem bearing small racemes or panicles in the axis of leaves in their ordinary form or reduced to bracts.

This species is proterandrous. The petals and stamens fall off before the 5 stigmas recurve to receive the pollen, insuring cross-fertilization.—A. F. FOERSTE, *Dayton, Ohio.*

Animal and Vegetable Chlorophyll.—To say that one difference between plants and animals is that the food of the former is inorganic and that of the latter organic is hardly a correct statement, for the food of both kinds of organisms is necessarily

organic and its consumption in both cases is attended by a true respiration. A better statement would be that plants, in general, have the power of making their own food, while animals, in general, do not. We recognize that the agent in this case is the granule of protoplasm colored by chlorophyll, just as in the consumption of the prepared food the activity is vested in uncolored protoplasm. The presence therefore of chlorophyll granules lies at the very basis of this distinction between plants and animals. It is generally stated that this does not ehold universally, as the fungi are devoid of chlorophyll and some animals are known to possess it. The question has now arisen, whether the so-called animal chlorophyll is the same as that of the plant. The results of some investigations upon this subject are given by K. Brandt in the *Popular Science Monthly* for October. The investigations seem to show that morphologically the animal chlorophyll is by no means the same as the plant, for the green bodies which appear in some animals are themselves cells rather than cell-contents, and are nothing else than unicellular plants which have immigrated to animal bodies. They are both morphologically and physiologically distinct from their hosts, for they can live when separated from them and form starch in the sunlight. Thus the distinction is based on the same principle as before, namely the power of originating, for now we can say not only that plants make their own food and animals do not, but also that plants make their own chlorophyll, while animals do not. But a strange revelation is the relation which these green algæ and other yellow algæ sustain to the animals in which they live. When they are absent the host animal must live like other animals, but when they are present they can prepare food for their host out of inorganic material and the animal can live with the surroundings of a plant. This partnership arrangement beween animals and plants upon the lowest confines of the two kingdoms may not seem unlikely now that it is suggested and reminds one of the sentence in Dr. Gray's *Darwiniana*, which says that "there is a limbo filled with organisms which never rise high enough in the scale to be manifestly either animal or plant, unless it may be said of some of them that they are each in turn and neither long." Chlorophyll thus holds the same relation to the bodies of animals which it inhabits as it does to plants, and although in the two cases it is morphologically distinct, it is physiologically the same.—J. M. C.

Epipactis Helleborine.—It may be of interest to you and the readers of the GAZETTE to learn that *Epipactis Helleborine* (the orchid, new to America, which was found near Syracuse, in 1879) has been discovered growing in considerable quantity on the wooded slope of Scajaquady's Creek, in the northerly portion of this city. The plant has been submitted to Gray, who while pronouncing it identical with the Syracuse plant, declares that he can discover no valid distinction between it and *Epipactis latifolia* Perhaps 200 individuals were noticed.—DAVID F. DAY, *Buffalo*, N. Y.

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Editorial.—In the October *Naturalist* J. B. Ellis and Dr. Geo. Martin describe 13 new species of fungi, 5 of which belong to the genus *Cercospora* and 4 to *Sphæria*.

A solution of caustic potash brings out clearly to the unaided eye the presence of the concealed chlorophyll in the red beet leaf, thus making it a good class illustration.

One of the best plants in which to observe the presence of starch in the chlorophyll masses is *Spirogyra*. There is no necessity of discharging the chlorophyll but the iodine test can be applied at once bringing out beautifully the rich starch contents.

Miss M. Bockee Flint, of Adrian College, Michigan, has just been observing the capsules of *Hamamelis Virginiana* discharge their seeds. A branch lying upon her table and drying rapidly, the capsules began to discharge and the shining black nutlets were sent upward to the ceiling, a distance of at least twelve feet.

Mr. H. W. Preston, in the November *Naturalist*, gives an account of a botanical excursion to Mt. Mansfield and Smuggler's Notch, Vermont, which is enough to make our collectors turn green with envy. Those of us who cannot visit these interesting places must content ourselves with the very beautiful specimens of Messrs. Pringle and Hosford.

In some of our horticultural journals a plea is being made for the cultivation of the much abused dandelion. Not as a pot herb, for this is already done, but as a brilliant flower, that can be made to show its bright gold when everything else is held in by the winter's chill. Success to our humble friend! and when we have ridden our own lawn of its myriad roots we too may be tempted to cultivate it.

In the *Torrey Bulletin* for October, Mr. E. L. Greene describes some more new western plants, one of them being a new genus of *Compositæ* and named *Holozonia*. This plant has been long known imperfectly and has been placed under both *Hemizonia* and *Lagophylla* under the specific name of *filipes*, but upon obtaining complete specimens Mr. Greene decides that it can belong to neither of these genera and the new one is proposed.

It is with regret that we have to record the death of one of our well known botanists. Mr. Elihu Hall, of Athens, Ill., died on the 24th of September last, at the age of 60 years. Mr. Hall's name is very intimately associated with many of our Rocky Mountain plants, the collection of Hall and Harbour in 1862, being among the richest in new species ever made. He botanized extensively in both Texas and Oregon, and in the second volume of the Gazette he published quite an extended list, with notes, of the "Arboreous, Arborescent and Suffruticose Flora of Oregon." The frequent appearance of the specific name *Hallii* among our western plants will ever be a reminder of him and his work, a reminder which he would most appreciate, his name linked with the plants he loved so well.

Dr. John A. Warder, President of the American Forestry Association, has just issued a pamphlet bearing the title "Woody Plants of Ohio." In this work he has been assisted by Davis L. James and Joseph F. James, of the Cincinnati Society of Natural History. Dr. Warder is an old and skillful forester and few men have so intimate a knowledge of the "tricks and ways" of our woody plants. Having been fortunate enough to drink inspiration from Nuttall himself, he has never lost it, and is ever anxious to impart his great practical knowledge to others. He has conceived rightly that there is dense ignorance among farmers as to trees and this pamphlet is ostensibly addressed to this class, for the purpose of instruction, but the numerous notes are of great value also to the scientific botanist.

Prof. G. Briosi, of Rome, announces the discovery of a new organ upon the germinating plant. It consists of a collar or ring from which develop the equivalents of long "root-hairs." This "annulus" appears at the junction of the caulicle and root. The discovery was made upon the germinating seeds of *Eucalyptus globulus*. This organ is, of course, by no means of universal occurrence and the author mentions a few species and groups in which it is found in greater or less prominence. Briosi considers the function of this collar of hairs that of ordinary root-hairs; "it is a provision for the absorption of moisture from the soil, which comes into action at a very early period in germination, before the root and its root-hairs are produced." An interesting notice of Briosi's paper is given by Dr. Gray in the *Am. Jour. Sci.* for October.

Prof. T. J. Burrill has for some years been engaged in studying a certain plant disease, known as blight, which he concludes is caused by the presence of living organisms known by that very poorly defined name, *Bacteria*. In the last number of the *Amer. Micr. Journal* he gives a very interesting account of certain vegetable poisons which he attributes to the presence of similar organisms. *Rhus Toxicodendron* was the most carefully observed and in its juices were discovered swarms of active bacteria, which

upon being applied to the skin in some way effected an entrance and soon began multiplying, giving rise to the well known itching and blisters. In the serum from the blisters the white blood corpuscles were found filled with wriggling bacteria. The same were found, though not so carefully studied, in the poisonous fungi. The conclusion is reached that many plants harbor these bacteria, which upon being transferred to man induce disease and hence are called poisonous.

IN A HISTORY OF Floyd County, Iowa, Prof. J. C. Arthur has published an account of the botany of that region. It has the merit of being an unusual method of treating such a subject which is at the same time philosophical. The usual method is to give a bare list of the Phanerogams, and may be the Ferns, entirely neglecting those vast groups of organisms which are below them in rank but are very important. Such a list could not be given in an exhaustive way but the grouping of the leading forms in a scientific way will be a revelation to old fashioned botanists who know of nothing lower than that old "catch-all" called "Fungi." Prof. Arthur explains all these groups in such a simple way that any one can understand them and know where to look for illustrative forms. The grouping is the one given in Bessey's Botany which divides the plant kingdom into seven great groups, viz: 1. *Protophyta* or Sexless Plants, and some of the uninitiated citizens of Floyd County must have been startled by the Professor when they read of some members of this group that "they creep about over the ground, and in dry weather crawl beneath the surface, or under sticks and leaves"; 2. *Zygosporeæ* or Unisexual Plants, under which a simple description of the common *Spirogyra* is given and certain molds; 3. *Oosporeæ* or Egg-spore Plants, illustrated by *Saprolegnia* or the fly-fungus and the potato-fungus; 4. *Carposporeæ* or Mushrooms and their Allies, in which group one can hardly look around without finding abundant means of illustration; 5. *Bryophyta* or Mosses and Liverworts; 6. *Pteridophyta* or Ferns and their Allies; 7. *Phanerogamia* or Seed-bearing Plants. The idea that Phanerogams form the principal part of the vegetable kingdom fades away under such a treatment of the subject and this great division shrinks to its proper dimensions as but one of seven groups. At the same time, while this is science, sentiment will always consider that Phanerogams contain about all the plants worth mentioning.

The black-fruited Cratægi and a new species.—We know within the limits of our flora of two black-fruited *Cratægi*, both from the western half of the continent. Mr. G. W. Letterman has now discovered a third one along Red River. These three species may be distinguished from our ordinary red-fruited ones, to be designated as Sect. *Erythrocarpus*, as Sect. *Melanocarpus*, and may be characterized by their black or black-purple or bluish fruit;

leaves, at least at first, appressed hairy on the upper and glabrous on the under side; flowers in corymbs, styles usually 5; spines mostly short and stout, often recurved. The three species are:

C. Douglasii, Lindl., the westernmost species, from British Columbia to California, with broader, thinner, doubly serrate leaves, the upper ones on the shoots lobed, and with broad, incised-toothed stipules; calyx lobes usually entire; fruit smaller, black-purple, ripe (in Northern California) in August; nutlets 2 to 3 lines long, strongly ridged on the back; spines ½ to 1 inch long.

C. rivularis, Nutt., in the Rocky and Wasatch Mountains of Colorado and Utah, with narrower, more rigid, lanceolate-ovate, singly serrate leaves, only the upper ones of the shoots broader, doubly serrate or rarely slightly incised, with narrow glandular-incised stipules; calyx lobes usually glandular; fruit larger; nutlets 3 lines long or over, usually strongly ridged on the back; spines few, ½ to 1 inch long.

C. BRACHYACANTHA, Sargent & Engelmann. A tree 20 to 30 feet high, or sometimes larger, with smoothish or, in very old trunks, rough bark; spines on the whitish branches numerous, stout, short (3 to 6 or 8 lines long), mostly curved, sometimes terminating the branches; leaves lanceolate-oblong to ovate or rhombic, 1½ to 2 or 2½ inches long, attenuate into a short petiole, thick and almost coriaceous, appressed-serrate, shining, with ribs almost obliterated, those of the terminal shoots larger, broader, slightly lobed, with large foliaceous dentate or sub-entire stipules *; flowers small for the genus, with broadly lanceolate entire calyx lobes and 5 styles; fruit depressed-globose, about ½ inch through, black-blue with bloom; nutlets (3 lines long) with 2 slight grooves on the nearly smooth back.

In the Red River region, first collected by *Drummond* (Louisiana Coll. 1832, no. 105 in part); Webster Parish, La., *C. Mohr*, 1880, both without flower or fruit; Concord, Texas, *C. S. Sargent*, March 29, 1881, with flower buds; west of Longview, Texas, *G. W. Letterman*, August 19, 1882, with mature fruit, "they looked from a distance like plum trees with small blue fruit, the ground under them was covered with the fallen haws." The species is easily recognized by its coriaceous, shining almost ribless leaves; in *C. Douglasii* they are broader, membranaceous and dull, in *C. rivularis* intermediate between the two.

I may add here that Prof. Sargent rediscovered the obscure *C. berberifolia*, Torr. & Gray, which was founded on a single flowerless specimen, in the very region, near Opelousas, Western Louisiana,

*The stipules of Cratægus are not often noticed and I am not sure that they possess much constancy or diagnostic value. Generally they are found only or at least are most persistent on the shoots; they are always oblique and petioled or stipulate, broadly triangular to linear, mostly incised-dentate or sometimes glandular-dentate, rarely entire.

where Dr. Carpenter first collected it about 50 years ago; it is a small tree with dark ash-gray branchlets bearing numerous long (1½ to 2 inches long) stout straight spines; leaves spatulate or obovate, obtuse, attenuate into a short petiole or almost sessile, simply serrate towards the upper part, ¾ to 1½ inches long; those of the shoots similar or acutish, often doubly or incisely serrate or slightly lobed, with linear glandular stipules, all persistently pubescent; compound corymb woolly; flowers large, calyx lobes linear, entire; styles 3; fruit unknown.—G. ENGELMANN.

Salix flavescens, Nutt., var. **Scouleriana.**—In undertaking a revision of the Willows for the *Flora of California* it was found that the material available for the purpose was, in some respects, very scant and unsatisfactory. The rich collections which have since been made, while confirming the accuracy of some portions of the work done under such unfavorable circumstances, reveal, in other directions, incompleteness and mistakes which I expect to correct in a lump by and by. It is desirable, however, that the following correction be made immediately.

The typical *Salix flavescens* of Nuttall is a Rocky Mountain shrub, or small tree, found also in the Sierra Nevada and the mountains of Oregon and Washington Territory, while the coast forms, constituting the greater portion of what is included under the name of *S. flavescens* in the Flora of California, should be arranged as a variety of that species for which the old name of *Scouleriana* might well be retained, and under which *S. brachystachys*, Benth., and *S. capreoides*, And., would be placed as striking modifications. While *S. flavescens* and var. *Scouleriana* exhibit an intricate diversity of forms which defy the drawing of any line between them, all are easily enough distinguished from their Atlantic representative *S. discolor*; and so also, *S. lasiolepis* and var. *Fendleriana* (of corresponding range and affinity) are more nearly allied to each other than is either to the Atlantic *S. lucida*. I may remark that this is in accordance with Prof. Sargent's recent statement that "the North American continent may be most conveniently divided, in regard to its forest geography, into Atlantic and Pacific regions, by the line of the eastern base of the Rocky Mountains."—M. S. BEBB.

The Flora of North America.—Last summer at Montreal Dr. Gray read a paper bearing the above title, which is so full of interest to every American botanist that we can hardly forbear publishing it in full as it appears in the *Am. Jour. of Science* for November. We will however pass over all that was said in regard to the Floras of Michaux and Pursh and give that concerning Dr. Gray's own work, for his name will always be more intimately associated with the North American Flora than that of any other botanist. There is too a good deal of ignorance as to the nature

of the work, and a false notion that it might be done faster. If any one should try such work, the only wonder would be that it could be done so rapidly. The appeal for help which Dr. Gray makes, as well as the protest against needless requests for information, deserve to be broadcast. The portion of the paper referring to Dr. Gray's connection with our flora is as follows:

I cannot say how early it was that my revered master, Dr. Torrey, conceived the idea of the Flora which he at length undertook. But he once told me that he had invited Nuttall to join him in the production of such a work, and that Nuttall declined. This must have been as early as the year 1832, that is, half a century ago. My correspondence with Dr. Torrey began in the summer of 1830, when I was a young medical student, and three or four years afterward I joined him at New York and became, for a short time, his assistant, for all the rest of his life his botanical colleague. He was very much occupied with his duties as professor, chiefly of chemistry; he had not yet abandoned the idea of completing his Flora of the Northern and Middle States, the first volume of which was finished in 1824, while yet free from all professional cares. Although working in the direction of the larger undertaking, the *Flora of North America* did not assume definite shape before the year 1835. I believe that some of the first actually-prepared manuscript for it was written by myself in that or the following year. I was then and for a long time expecting to accompany the South Pacific Exploring Expedition, as originally organized under the command of Commodore Ap. Catesby Jones, but which was subject to long delay and many vicissitudes; during which, having plentiful leisure, I tried my prentice hand upon some of the earlier natural orders. Before the expedition, as modified, was ready to sail, under the command of Capt. Wilkes, I had accepted Dr. Torrey's proposal that I should be his associate in the work upon which I had made a small beginning as a volunteer. Two parts, or half of the first volume (360 pages), of this Flora, were printed and issued in July and October, 1838.

It was thought at first, in all simplicity, that the whole task could be done at something like this rate. But, apart from other considerations, it soon became clear that there had been no proper identification of the foundation-species of the earlier botanists, from Linnæus downward; and that our Flora could not go on satisfactorily without this. Dr. Torrey had, indeed, some years before, made a hasty visit to Hooker at Glasgow, to London, and to Paris; but the taking of a few notes upon some particular plants in the herbaria of Hooker, Lambert, and Michaux, and the acquisition, from Hooker, of a good set of the Arctic plants of the British explorers, was about all that had been done. I proposed to attempt omething more; so, taking advantage of a favorable opportunity, I sailed for Liverpool in November, 1838, and devoted a good part

of the ensuing year to the examination of the principal herbaria, which I need not here specify, in Scotland (where the important one of Sir Wm. Hooker still remained), England, France, Switzerland and Germany, namely those which contained the specimens upon which most of the then-published North American species had been directly or indirectly founded, especially those of Linnæus and Gronovius, of Walter, of Aiton's Hortus Kewensis, Michaux, Willdenow, Pursh, and the later ones of DeCandolle and Hooker.

After my return the work made good progress: the remaining half of the first volume was brought out in the spring of the year 1840, and by t e spring of 1843 the 500 pages of the second volume, mostly occupied by the vast order Compositæ, had been issued. But meanwhile I had in my turn to assume professorial duties and incident engagements,—with the result that, although the study of North American plants was at no time pretermitted, either by Dr. Torrey while he lived, or by myself, we were unable to continue the publication during my associate's life-time; and it was only recently, in the spring of 1878, that I succeeded in bringing out, in a changed form, another instalment of the work, completing the *Gamopetalæ*.

In the interval I had made two year-long visits to Europe for botanical investigation, the first partly relating to the botany of the South Pacific, the second wholly in view of the North American flora. And since the last publication still another visit—the fourth and we may suppose the last—of the same character and the same duration, has been successfully accomplished.

The serious question, in which we are all concerned, arises, whether this work can be carried through to a completion, and the older parts (wholly out of print and out of date) re-elaborated—I will not say by my hands—but in my time, or soon enough to render the whole a reasonably full and homogeneous representation of the North American flora, as known in this latter part of the nineteenth century. And it brings us to consider why the undertaking to which so much time has been devoted, should be so slow of accomplishment.

If this slowness is a constant wonder and disappointm nt to most people interested in the matter, I can only add that it is hardly less so to myself. It is a constant surprise—if one may so say—that the work does not get on faster.

Of course the undertaking has become more and more formidable with the enlargement of geographical boundaries and of the number of species discovered. As to the increase in the number of species to be treated, we have by no means yet reached the end. The area, that of our continent down to the Mexican line, we trust is definitely fixed, at least for our day. And, since we cannot be rid of the peninsula and keys of Florida, which entails upon us a considerable number of tropical species, mostly belonging to the West Indies—the southern boundary is now as natural a one as we can have.

The area which Pursh's Flora covered was, we may say, the United States east of the Mississippi, with Canada to Labrador, to which was added a couple of hundred of species known to him outside these limits northwestward.

Torrey and Gray's Flora took the initiative in annexing Texas ten years before its political incorporation into the Union: although the only plants we then possessed from it were certain portions of Drummond's collections. California was also annexed at the same time, on account of Douglas's collections, and those of Nuttall, who had just returned from his visit to the western coast, which he reached by a tedious journey across the continent over ground in good part new to the b tanist. Douglas had already made remarkably full collections along a more northern line. The British arctic explorers, both by sea and land, had well developed the botany of the boreal regions, and Sir Wm. Hooker was bringing out the results in his Flora of British America. Of course our knowledge of the whole interior and western region was small indeed, compared with the present; and the botany of a vast region from the western part of Texas to the Californian coast was absolutely unknown, and so remained until after the publication of the Flora was suspended.

As to the number of species which Torrey and Gray had to deal with, I can only say that a rapid count gives us for the first volume about 2200 Polypetalæ; that there are 109 species in the small orders which in the second volume precede the *Compositæ*; and that there are of the *Compositæ* 1054. So one may fairly conclude that if the work had been pushed on to completion, say in the year 1850, the 3076 species of Pursh's Flora in the year 1814 might have been just about doubled. Probably more rather than less; for if we reckon from the number of the *Compositæ*, and on the estimate that they constitute one-eighth of the phænogamous plants of North America, instead of 6150, there would have been 8430 species known in the year specified.

It most concerns us to know the number of species which, after the lapse of thirty years more—years in which exploration has been active, and has left no considerable part of our great area wholly unvisited—the now revived Flora has to deal with. We can make an estimate which cannot be far wrong. In the year 1878, my colleague, Mr. Watson, finished and published his Bibliographical Index to the Polypetalæ of North America, covering, that is, the same ground as the first volume of Torrey and and Gray's Flora, completed in 1840. In it the 2200 species of the latter date are increased to 3038. The "*Gamopetalæ* after *Compositæ*" in the Synoptical Flora, brought out in the same year, contains 1656 species. The two together must make up half of our phænogamous botany, that is, adding the increase of the last four years, about 5000 species. And so Mr. Watson adopts the estimate of 10,000 species for our known Phænogams and Ferns.

My impression is that the species of *Compositæ* have increased at a rate which, unless they exceed the eighth part of our Phænogams, will warrant a still higher estimate. The number of introduced species of various orders, which will have to be enumerated and most of them described, is, unhappily, fast increasing*; and new indigenous species are almost daily coming to us from some part or other of our wide territory. So that the 10,000 species of this estimate may before long rise to eleven or twelve thousand. Only the experienced botanist can form a just idea of what is involved in the accurate discrimination and proper co-ordination of 10–12,000 species, and in the putting of the results into the language and form which may make our knowledge available to learners or to succeeding botanists.

Moreover, there is of late an *embarras des richesses* which is becoming serious as respects labor and time. The continued and ever increasing influx of materials to Cambridge, beneficial as it ever is, is accountable for this retardation of progress in a greater degree than almost any one would suppose. The herbarium, upon whose materials this work is mainly done, and which has been, like the Temple, full forty and six years in building, has received the contributions of two generations of botanists, and the Torrey herbarium goes back one generation further. Still the number of American specimens annually coming to it is greater than in most former years. Apart from the mere selection and care of these, consider how in other ways it affects the rate of progress of the Flora. The incoming of additional specimens may at a glance settle doubts as to the validity of a species; but new specimens are as apt to raise questions as to settle them, more commonly they raise the question as to the limitation and right definition of the species concerned, not rarely, also, that of their validity. When one has only single specimens of related species, the case may seem clear and the definition easy. The acquisition of a few more, from a different region or other conditions, almost always calls for some re-consideration, not rarely for re-construction. People generally suppose that species, and even genera, are like coin from the mint, or bank notes from the printing press, each with its fixed marks and signature, which he that runs may read, or the practiced eye infallibly determine. But in fact species are judgments—judgments of variable value, and often very fallible judgments, as we botanists well know. And genera are more obviously judgments, and more and more liable to be effected by new discoveries. Judgments formed to-day—perhaps with full confidence, perhaps with misgiving—may to-morrow, with the discovery of new materials or the detection of some before unobserved point of structure, have to be weighed and decided anew. You see

* I say "unhappily," for they adulterate the natural character of our flora, and raise difficult questions as to how much of introduction and settlement should give to these denizens the rights of adopted citizens.

how all this bears upon the question of time and labor in the preparation of the Flora of a great country. If even in old Europe the work has to be done over and over,how much more so in America, where new plants are almost daily coming to hand. It is true that these fall into their ranks, or are adjustable into their proper or probable places, but not without pains-taking and tedious examination.

Of our Flora, it may indeed be said, that "If 'twere done when 'twere done, then 'twere will it were done quickly." But I may have made it clear that, in the actual state of the case, it is likely to be done slowly. At least you will understand why thus far it has been done slowly. As to the future, if it depended wholly upon me, the completion would obviously be hopeless. I need not say that our dependence, for the actual elaboration, must largely be upon associates, upon the few who have the training and the vast patience, and the access to herbaria and libraries, requisite for this kind of work, but above all upon my associate in the herbarium at Cambridge, to whom, being present with us, I will not further allude.

Of course we rely, very much indeed, upon the continued cooperation of all the cultivators of botany in the country; and it is gratifying to know that their number is increasing, new ones not less zealous than the old, and better equipped, are taking the places of those that have passed away and some of them extending their explorations over the remotest parts of the land, and into districts where there is most to be discovered. All can help on the work, and all are doing so, by the communication of specimens and of observations. Those within the range of the published manuals and floras get on—or should get on—with only occasional help from us. They should send us notes and specimens to any amount; but they should not ask us to stop to examine and name their plants, except in special cases, which we are always ready enough to take up. Those who collect in regions as yet destitute of such advantages may claim more aid, and we take great pains to render it; partly on our own account, that we may assort their contributions into their proper places, partly for the encouragement of such correspondents, who otherwise would not know what they have obtained, and who naturally like to know when they have made interesting discoveries.

But the scattered piecemeal study of plants is neither very satisfactory nor safe. And it involves great loss of time, besides interrupting that continuity and concentration of attention which the proper study of any group of plants demands. As respects the orders of plants which are yet to be elaborated for the Flora, and as to plants which require critical study or minute examination, necessarily consuming much time, it is better to defer their complete determination until the groups to which they severally belong are regularly taken in hand.

The co-operation of all our botanical associates is solicited in this regard, as a matter of common interest and advantage. For we are all equally concerned in forwarding the progress of the Flora of North America; and we may confidently expect from our botanical associates their sympathy, their forbearance, and their continued aid.

Albinism in Gentiana crinita.—I noticed in the window of one of our Boston city florists a few mornings ago two large bunches of white fringed gentian, and on enquiry learned that they came from Middlesex County, Mass. The petals of the open flowers were creamy white, and the face had a beautiful satiny lustre.

Later my friend Storrow Higginson informed me that he had seen in another florist's window white gentians that were gathered in Brookline, Mass. Mr. Higginson procured a specimen for analysis, but could not find any other difference between it and the normally blue flowers. He commented, however, on the perfect whiteness of the fringe.

I do not now recall any previous mention of albinism in this flower, although it may have been recorded. I have not time at present to look it up, but in any case a record of the present instances may be of interest.—GEO. E. DAVENPORT, *Medford, Mass.*

Trifolium hybridum, L.—On reading, in the October number of the GAZETTE, Mr. James' note on this species of *Trifolium*, I thought it might be of interest to note, that in Western Canada it is not at all uncommon, and about London I find it plentiful. It occurs not only in old fields and along fence sides, but I have found it in woodlands and along the borders of cedar swamps at quite a little distance from any cultivated ground, showing that here at least it has become pretty firmly fixed.

In a synopsis of the Flora of the Valley of the St. Lawrence and Great Lakes, published by Profs. Macoun and Gibson, in the Canadian Journal for January 1877, it is catalogued as "Introduced. Cultivated fields and along fences. Is very extensively cultivated in the West instead of *T. pratense.*"

It is also reported from Eastern Canada in the vicinity of Ottawa, in the proceedings of the Ottawa Field Naturalist's Club for 1879 and '80, and in a letter just to hand from Prof. Macoun, he tells me that he found this species of *Trifolium* growing most luxuriantly at the foot of the Schickshook Mountains, Quebec, in the vicinity of an old camp, thirty miles from any cultivation.—T. J. W. BURGESS, M. D., *London, Ontario, Canada.*

A New Polyporus.—POLYPORUS RENIFORMIS, n. sp. Pileus sessile or substipitate, reniform or dimidiate, ascending, concave above and convex below; the surface ferruginous, concentrically sulcate and subzonate; the margin thin and acute; the context ferruginous, soft, floccose, covered with a thin rigid rather elastic

crust: stratum of tubules occupying about a third of the pileus, ferruginous within, their mouths very small and covered but not closed with a white powder. Spores ferruginous, elliptic-ovoid, .008–.001 mm. long by .006–.007 mm. broad.

Pileus projecting 2–4 in. with a breadth of 3–6 in. and a thickness at the base of ¾–1½ in. gradually thinning out all round to the edge. This species is properly always annual; there are indeed stratified specimens of two or three years growth but in all cases a new stratum of hymenophore is formed for each annual layer of tubules, leaving the preceding growths to crumble and decay.

Growing always about the base of old stumps in an ascending position; I have never found a specimen upon a log. I have met with the species from Dayton, O., down the Miami Valley to Cincinnati and into Kentucky beyond Lexington.

This is a curious member of the group of FOMENTARII of Fries. It has passed heretofore for *P. applanatus*, Pers., but the true *applanatus* grows here abundantly upon stumps and logs and Mr. James, Mr. Meyncke and myself readily distinguish one from the other upon sight. It will be seen that it has affinities also with *P. lucidus*, Leys.—A. P. MORGAN.

Lactuca Scariola, L.—This plant, possessing the habit of the Compass Plant in placing its vertical leaves so as to point to the poles, at the time of the publication of Gray's Manual, last edition, was known only at Cambridge, Mass. In a short time it has reached the Mississippi. It is quite abundant at Dayton, Ohio. At Put-in-Bay, Lake Erie it has already become a pest. It is beginning to make its appearance about Detroit, Mich. A few specimens (3–5) were observed by myself at Lincoln in Central Illinois. The above stations I found myself. It is in the list of H. Eggert of St. Louis, Mo. Mr. Bebb has found it at Rockford, Ill. The latter city is so close to Wisconsin that the plant probably grows there or soon will reach that state. A friend, not a botanist, but a good observer, claims to have seen the plant near Richmond, Indiana. The geographical distribution of *Lactuca Scariola*, therefore, west of the Alleghanies, would be *Ohio to Missouri and northward*.—AUG. F. FOERSTE, *Dayton, Ohio*.

The Gazette for 1883.—The attention of our readers is called to the fact that the time for the renewal of subscriptions has come. Every year has brought a large increase to our subscription list and we can assure our patrons that Volume VIII will contain much to interest and instruct. And again we would repeat to our more modest and retiring botanists what we have said so often, that while giving space to somewhat formal papers it is by no means to the exclusion of notes and scraps of information given in the most informal way.

Botanical Gazette.

Vol. VII. DECEMBER, 1882. No. 12.

Editorial.—J. B. ELLIS and Dr. G. B. Martin, in the December *Naturalist* describe 24 new species of North American Fungi.

THE GENUS PANICUM has had enumerated under it as many as 850 species, which have now been reduced to 250.

THE POPULAR SCIENCE MONTHLY for December contains a portrait and sketch of Matthias Jacob Schleiden, a name inseparably connected with plant histology.

THE GARDENER'S MONTHLY continues to hold its own and its indefatiguable editor collects every month a great amount of material which must be of great interest to the class of persons addressed.

MR. HARRY N. PATTERSON, of Oquawka, Ill., is about to print some very neat genus labels, including all the North American genera down to *Azolla*, numbering about 1500. They can be obtained at the rate of 20 cents per hundred, no orders being taken for less than the whole number.

THE AMERICAN NATURALIST closes its sixteenth volume handsomely and is well entitled to the position of the most popular scientific periodical in the country. The department of botany, under the direction of Prof. Bessey, has been a great success during the past year and promises the same for the next.

MR. J. G. LEMMON continues to advertise his splendid collections at a very low price. Sets of Phænogams are offered at $7.50 per 100, while over 70 species of ferns, containing several new to North America, and some new to science, can be obtained at 15 cents each. New species are offered at 25 cents each.

PROF. W. J. BEAL has long been experimenting in the cross-breeding of Indian corn. During the last season some "crossed seed" was planted, having been obtained from parents raised 100 miles apart, both of the same variety. The result was that "the crossed stock exceeded the pure stock of the best parent as 121 exceeds 100."

AMONG THE EDITORIALS of the last GAZETTE was one referring to the "nutlet" of *Hamamelis*, which should of course read "seeds." It might have been mentioned in the same connection that the

seeds are thrown just as in *Viola*, by the squeezing together of the valves, just as a moist apple seed is projected from between the fingers by simple pressure.

THE AM. MONTHLY MICR. JOUR. says that if the pollen grains of *Narcissus poeticus* be placed in the mucilage obtained from the stem of the plant and kept at a temperature of 55° to 60° Fahr. the pollen tubes will grow rapidly and currents of protoplasm will be seen within them. This is surely worth a trial by our teachers. Talking of pollen grains, the same Journal says that castor oil is one of the best mounting mediums for them, clearing them beautifully and showing their markings very distinctly.

THE AUSTRALIAN BIG TREES are coming to be better known as the trackless forests of that new world are yielding up their secrets to the explorer. Victoria now claims to possess the biggest living "big tree" in the world. It is a *Eucalyptus amygdalina* and measures 380 feet to the top, and has a circumference of 60 feet at some distance from the ground. An exchange suggests a good comparison by saying that the tree only lacks 10 feet of being twice as high as Bunker Hill Monument.

MR. R. DOUGLAS, of Waukegan, Ills., one of our most experi enced foresters, writes for the last *Gardener's Monthly* upon the subject of the succession of forest growth. His extended observations go to show that forests destroyed by the axe, and the fire kept out, will reproduce the same species. In burned districts however such is not the case, the first tree making its appearance being generally the Aspen, sometimes the White Birch. The only coniferous trees that can ever survive such a catastrophe are a few pines with very hard cones.

IN THE TORREY Bulletin for November is given an account with figures, of a curious phenomenon described in *La Nature*. In South America north of the Amazons there was found a small reptile, the jaracaca, within the trunk of a tree of common occurrence, the "ipe-mirim," whose body, with the exception of the center, had become completely lignified, even some of the delicate anatomical details being faithfully retained, just as in petrifaction. Of course the reptile was imbedded in the cambium-layer. Other cases are given illustrating the same power of the cambium.

FLORA OF JACKSON COUNTY, by Frank Bush, has just been received. So far as title page or introduction tell we are left to guess at the state, which only appears in the imprint to be Missouri. In lists meant for foreign distribution the name of the state should be as prominent as that of the county. Mr. Bush has given us a very creditable catalogue, of 20 pages, and 600 species. The "Introduction" gives a good idea of the topography of the county and contains the following general statement with regard to the plant orders: "As will be seen, our Flora is devoid of Club-mosses, Pines, Spruces and Heaths, contains but few Lilies,

Orchids, Polemoniums and Ferns, while it is very rich in Composites, Labiates, Figworts and Solanums."

MR. MEEHAN in a recent communication to the Philad. Acad. Sci. brought up the question of the manner of entrance of the sporidia of parasitic fungi. The specimens suggesting the question were the common *Panicum sanguinale*, or "crab-grass," which were infested by *Ustilago Rabenhorstiana*. Dr. E. Queckett in the Trans. Linn. Soc. had detailed some experiments which seemed to show that the sporidia of the ergot might pass into the circulation of the plant in the water absorbed by the roots. Most unlikely as this seems Mr. Meehan thought his observations looked in the same direction. The *Panicum* observed was in a field full of individuals and while 50 culms of one plant were infested, the culms interlocking with them and the thousands of others were entirely free; and besides the spikelets were attacked while closely invested by the sheath. All this of course is of the nature of negative proof, but taken with Queckett's experiments may mean something.

FLORA OF NORTH AMERICA.—In the last GAZETTE there was published a part of Dr. Gray's address at Montreal upon the above subject. The part selected was that describing his own relation to North American Botany. We give this month that which gives an account of the work upon the Flora of North America before the publication of Torrey and Gray's Flora.

Only two Floras of North America have ever been published as completed works, that of Michaux and that of Pursh. A third was begun (by Dr. Torrey, assisted by a young man who is no longer young) by the publication in the summer of 1838 of a first fasciculus; the first volume of 700 pages was issued two years afterward; and 500 pages of the second volume appeared in 1841 and in the early part of 1843. The time for continuing it in the original form has long ago passed by. Its completion in the form in which I have undertaken it anew, is precarious. *Precarious* in the original sense of the word, for it is certainly to be prayed for: precarious, too, in the current sense of the word as being uncertain; yet not so, according to an accepted definition, viz: "uncertain, because depending upon the will of another;" for it is not our will but our power that is in question; and it is only by the combined powers and efforts of all of us interested in Botany that the desired end can possibly be attained.

It were well to consider for a moment how and why it is that a task which has twice been—it would seem— easily accomplished has now become so difficult.

The earliest North American Flora, that of the elder Michaux, appeared in the year 1803. It was based entirely upon Michaux's own collections and observations, does not contain any plants which he had not himself gathered or seen, is not, therefore,

an exhaustive summary of the botany of the country as then known, and so was the more readily prepared. Michaux came to this country in 1785, returned to France in 1796, left again in Baudin's expedition to Australia in 1800, and died of fever in Madagascar in 1802. The Flora purports to be edited by his son, F. A. Michaux, who signed the classical Latin preface. The finish of the specific characters, and especially the capital detailed characters of the new genera, reveal the hand or a master; and tradition has it that these were drawn up by Louis Claude Richard, who was probably the ablest botanist of his time. This tradition is confirmed by the fact that Richard's herbarium (bequeathed to his son, and now belonging to Count Franqueville) contains an almost complete set of the plants described, and I found that the specimens of Michaux supplied to Willdenow's herbarium at Berlin were ticketed and sent by Richard. Not only the younger Richard but Kunth also habitually cited the new genera of the work as of Richard, and some others have followed this example. Singularly enough, however, there is no reference whatever to Richard in any part of the Flora, nor in the elaborate preface. The most venerable botanist now living told me that there was a tradition at Paris that Richard performed a similar work for Persoon's *Synopsis Plantarum*, and that he declined all mention of his name in the Synopsis and in the Flora, because the two works—contrary to the French school—were arranged upon the Linnæan Artificial System. He had his way, and the tradition may be preserved in history; but his name cannot be cited for the genera *Elytraria*, *Micranthemum*, *Elodea*, *Stipulicida*, *Dichromena*, *Oryzopsis*, *Erianthus*, and the like. For, by the record these are of *Michaux*, *Flora Boreali-Americana*, and not of Richard.

Michaux's explorations extended from Hudson's Bay, which he reached by way of the Saguenay, to Florida, as far, at least, as St. Augustine and Pensacola; he was the first botanical explorer of the higher Alleghany Mountains, and, crossing these mountains in Tennessee, he reached the Mississippi in Illinois, and was as far south as Natchez. His original itinerary, which I once consulted, is preserved by the American Philosophical Society, at Philadelphia, to which it was presented by his son. It ought to be printed. That little journal shows that it was not Michaux's fault that the first Flora of North America was restricted to the district east of the Mississippi River. He had a scheme for crossing the continent to the Pacific. He warmly solicited the government at Washington to undertake such an exploration, and offered to accompany it as naturalist. This may have been the germ or the fertilizing idea of the expedition of Lewis and Clark, which was sent out a few years afterward by Jefferson, to whom, if I rightly remember, Michaux addressed his enterprising proposal.

Leaving out the Cryptogams of lower rank than the Ferns, we find that the Flora of Michaux, published at the beginning of

this century, say eighty years ago, contains 1530 species, in 528 genera. No very formidable number; as to species (speaking without a count) little over half as many as are described in my Manual of the Botany of the Northern States, which covers less than half of Michaux's area.

Eleven years afterward, namely, in the year 1814 (the preface is dated December, 1813), appeared the second Flora of North America, namely the *Flora Americæ Septentrionalis*, by Frederick Pursh. This was not confined to the author's own collections, but aimed at completeness, or to give "a systematic arrangement and description of the plants of North America, containing, besides what have been described by preceding authors, many new and rare species, collected during twelve years' travels and residence in that country."

It appears that Pursh was born at Tobolsk, in Siberia, of what parentage we do not know. He himself tells us, in his preface, that he was educated in Dresden, and that he came to this country—to Baltimore and Philadelphia,—at the close of the last century, when he must have been only twenty-five years old. He was able to make the acquaintance not only of Muhlenberg, who survived until 1815, and of Wm. Bartram, who died in 1823, but also of the veteran Humphrey Marshall, who died in 1805. His early and principal patron was Dr. Benjamin Smith Barton, who supplied the means for most of the travels which he was able to undertake, and who, as Pursh states, "for some time previous had been collecting materials for an American Flora." Pursh's personal explorations were not extensive. From 1802 till 1805 he was in charge of the gardens of Wm. Hamilton, near Philadelphia. In the spring of the latter year, as he says, he "set out for the mountains and western territories of the Southern States, beginning at Maryland and extending to the Carolinas (in which tract the interesting high mountains of Virginia and Carolina took my particular attention), returning late in the autumn through the lower countries along the sea-coast to Philadelphia." But, in tracing his steps by his collections and by other indications, it appears that he did not reach the western borders of Virginia nor cross its southern boundary into the mountains of North Carolina. The Peaks of Otter and Salt-pond Mountain (now Mountain Lake,) were the highest elevations which he attained. Pursh's preface continues: "The following season, 1806, I went in like manner over the Northern States, beginning with the mountains of Pennsylvania and extending to those of New Hampshire (in which tract I traversed the extensive and highly interesting country of the Lesser and Great Lakes), and returning as before by the sea-coast." The diary of this expedition, found among Dr. Barton's papers and collections in possession of the American Philosophical Society, has recently been printed by the late Mr. Thomas Potts James. It shows that the

journey was not as extended or as thorough as would be supposed; that it was from Philadelphia directly north to the Pokono Mountains, thence to Onandaga, and to Oswego,—the only point on the Great Lakes reached,—thence back to Utica, down the Mohawk Valley to Saratoga, and north to the upper part of Lake Champlain and to the lesser Green Mountains in the vicinity of Rutland, but not beyond. Discouraged by the lateness of the season, and disheartened—as he had all along been—by the failure and insufficiency of remittances from his patron, Pursh turned back from Rutland on the 22d of September, reached New York on the 1st of October, and Philadelphia on the 5th. The next year (1807) Pursh took charge of the Botanic Garden which Dr. Hosack had formed at New York and afterward sold to the State, which soon made it over to Columbia College. In 1810, he made a voyage to the West Indies for the recovery of his health. Returning in the autumn of 1811, he landed at Wiscasset, in Maine, "had an opportunity of visiting Professor Peck of Cambridge College, near Boston," and of seeing the alpine plants which Peck had collected on the White Mountains. At the end of the latter year or in 1812 he went to England with his collections and notes; and at the close of 1813, under the auspices of Lambert, he produced his Flora, consulting, the while, the herbaria of Clayton, Pallas, Plukenet, Catesby, Morison, Sherard, Walter, and that of Banks. Evidentaly such consultations and the whole study must have been rapid. The despatch is wonderful. One can hardly understand the ground of the statement made by Lambert to my former colleague, Dr. Torrey, that he was obliged to shut Pursh up in his house in order to keep him at his work.

I do not know how Pursh was occupied for the next four years, nor when he came to Canada. But he died here at Montreal, in 1820, at the early age of forty-six. More is probably known of him here. If I rightly remember, his grave has been identified, and a stone placed upon it inscribed to his memory. A tradition has come down to us—and it is partly confirmed by a statement which Lambert use to make, in reference to the vast quantity of beer he had to furnish during the preparation of the Flora—that, in his latter days, our predecessor was given to drink, and that his days were thereby shortened.

In Pursh's Flora we begin to have plants from the Great Plains, the Rocky Mountains, and the Pacific Coast, although the collections were very scanty. The most important one which fell into Pursh's hands was that of about 150 specimens, gathered by Lewis and Clark on their homeward journey from the mouth of Columbia River. A larger collection, more leisurely made on the outward journey, was lost. Menzies in Vancouver's voyage had botanized on the Pacific coast, both in California and much farther north. Some of his plants were seen by Pursh in the

Banksian Herbarium, and taken up. I may here say that in the winter of 1838—39 I had the pleasure of making the acquaintance of the venerable Menzies, then about ninety-five years old.

In the Supplement, Pursh was able to include a considerable number of species, collected by Bradbury on the Upper Missouri, in what was then called Upper Louisiana,—much to the discontent of Nuttall, who was in that region at the same time, and who, indeed, partly and imperfectly anticipated Pursh in certain cases, through the publication by the Frasers of a catalogue of some of the plants collected by Nuttall.

To come now to the extent of Pursh's Flora, published nearly sixty-nine years ago. It contains 740 genera of Phænogamous and Filicoid plants, and 3076 species. Just about double the number of species contained in Michaux's Flora of eleven years before.

The Cell-State.—One of the most interesting articles recently published in the *Popular Science Monthly* is that of Prof. Ferdinand Cohn, of Breslau, bearing the above title. It is especially interesting to a lecturer and teacher who is always casting about for apt illustrations which will make plain and fix in the memory truths which stated in a technical way would make no impression. Prof. Cohn considers cells as individual citizens, leaves as villages, and the whole plant as a state, and very aptly carries out these figures in explaining the relation of different parts in the life work of the plant. How extensively he has done this may be inferred from his conclusion:

"Gifted writers on social politics have recently endeavored to illustrate the development and interrelations of human society by analogy with a living being and its cells. We have taken the converse course, and have endeavored to make the life of the plant and its cells comprehensible by a similitude with a state organization and its citizens. We have endeavored to show that what man has regarded as the highest ideal of his conscious effort in the struggles of the world's history has been prefigured in quiet accomplishment in the world of plants. It is the representative of the idea of the state which leaves its individual citizens to develop themselves freely according to their inborn natures, and to work together on an equal footing for the good of the whole; which preserves to the villages and the provinces their self-administration, and yet subjects them in every instant to the higher interests and laws of the whole; which appears ready armed against the external enemy, preserves peace and unity within; which applies the capital accumulated by the common labor of all the citizens to the advantage and advancement of the whole, without letting it be preyed upon by any; which in untiring activity never suffers a pause, and by continuous renovation endures for centuries, always increasing, always blossoming, and always bearing fruit."

By way of illustration we extract the following sentence, descriptive of the work of the roots and leaves:

"The cells of the roots, like hewers and miners, sink numerous shafts in the spaces assigned to them, drive their galleries toward all points of the compass, in order to break up the mineral treasures, separate them from the incasing stone, and set the machinery of service into motion; day and night with inexhaustible diligence, they extract atom by atom of potash and ammonia, phosphoric and nitric acid, and, without working up their ore, deliver it over to the conducting vessels which transmit it by their powerful system of sucking and forcing pumps to the stem and the leaves. The leaves are cell-villages which perform their daily tasks in the air and the light. Their principle business is to obtain coal, which is the chief constituent of the vegetable body. Our atmosphere is an enormous coal-mine, many miles in thickness, that can not be exhausted in thousands of thousands of years. The coal, indeed, is not found pure in the air, any more than the metal in the ore, but is in combination with oxygen as a transparent gas, carbonic acid, and a peculiar art is required to separate it.

In the mining districts, smelting-houses are erected beside the pits, where the noble metal is extracted from the impure ores. The green cells of the leaves combine the art of the miner with that of the smelter, and have the power of extracting the pure carbon from the atmosphere. In order to perform this work, they must be shone upon by the sun, for the sunlight alone can excite in them the marvelous faculty. Having extracted the carbon, they combine it with water and with the mineral substances that have been drawn from the soil, and prepare from them the living matters out of which the plant itself builds up its cells, and which, taken up into the body of an animal, is transformed by it into flesh and blood."

Such illustrations lighten up the dry technicalities so often used in teaching and lie at the very basis of the great power possessed by some of our lecturers on botany.

Epidendrum cochleatum, L.—Some two years ago I mentioned having discovered in Southern Florida a curious and, to me, new *Orchid*. The plant came into flower during the summer following my discovery. I at once sent it to Prof. Watson for determination. I thought it might be new to science. In due time Prof. Watson reported it to be as above and sent me a full description. He remarked, however, that I was the first one to notice its occurrence in the United States, though the species is common in Central America and the West Indies. Mr. Curtiss also had never seen the species during his very extensive explorations in Florida. The plant in question I found at Jupiter Inlet on the Atlantic coast. It was clinging to the upper limbs of a large live oak and was the only specimen I have seen. Further investigation will undoubtedly reveal more.—W. W. CALKINS, *Chicago, Ill.*

Forest Fires.—Prof. C. S. Sargent this month presented a paper to the Massachusetts State Board of Agriculture on the subject of Forest Fires. Prof. Sargent's facts and opinions are especially valuable as no one has had more extensive means of observation upon all that pertains to forests. In this paper it is stated that the extent of the loss to the country every year from forest fires is something which would astonish the best informed. Not only is the timber destroyed but the fertility of the soil itself, so that it is incapacitated from producing valuable trees again. The following very interesting extract from a report in the *N. Y. Tribune* gives a good idea of the results of a forest fire:

If a forest is destroyed by a fire, which kills the trees and undergrowth of shrubs and herbs, the same species, except in the case of some our least valuable trees, rarely spring up again. Let us take the case of a white pine forest, because the white pine is probably the most valuable forest tree in New England. If a forest of white pine is destroyed by fire this tree does not spring up again, as it would under proper care, and the land is not covered again with any growth of trees for a considerable period. The fire-weed first makes its appearance. The light seed of this plant is often blown for a long distance, and falling upon the bare ground germinates quickly and finially covers the burned surface with vegetation. Birds drop the seeds of raspberries and blackberries, which find sufficient nourishment and light for germination. These, as they grow, cover the ground and afford protection to the stones of the little Moreton cherry, dropped by birds also, or to the light seeds of the gray birch, or some of the willows or poplars, which are constantly blowing about and will germinate anywhere upon any unshaded ground. These are generally the first trees which succeed a fire-swept pine wood. But years elapse before the ground is recovered, even with such trees. The cherries, and the birch and poplars are short-lived and are succeeded by more valuable broad-leaved trees. Squirrels and other animals deposit acorns in the ground, and the wind brings the seeds of maples, ashes and the valuable birches. Such seeds find protection among the poplars and willows which had sprung up, and as these die, the more valuable trees get a chance to grow and gradually occupy the ground. This new forest of hardwood trees, if protected from the fire, will long occupy the ground; and the orignal pine will not appear again until the land, long enriched by an annual depcsit of leaves, has been once more stripped of its tree covering and mellowed by years of cultivation.

Such land nearly all over New-England is freed from the plough or the scythe, and, guarded from the fire and pasturage, grows up again with pine. The different processes, however, by which white pine land has been again brought into the condition to produce spontaneously another crop of pine, have occupied a long period of time—so long, indeed, that it must extend through gen-

erations of human life. The forest fire, then, which destroyed the pine, destroyed as well the capacity of the land to produce a similar crop for a period of from 50 to 100 years. The damage inflicted upon the land is, of course, not irreparable in a climate like that of New-England, where the annual rainfall is sufficient always to insure a growth of trees of some sort upon undisturbed ground,and sooner or later in the ordinary workings of Nature's laws forests will succeed each other here; but in some parts of the country where the rain fall is so slight that there is a constant and severe struggle between the forest and the plain and where trees under the most favorable conditions barely exist, a fire not only kills the forest but it makes any future growth of trees impossible. We in New-England are more fortunate; and it is entirely within our power to regulate the composition of our forests and maintain a proper proportion between forest areas and farming land.

The Orgin of our Vernal Flora.—The following remarks on this interesting subject have just appeared in "Nature," by Dr. J. E. Taylor. It is usual to assign an Arctic origin to our mountain flora, and the floral comparisons and statistics fully bear out this brilliant generalization. It is formulated that height above the sea-level is climatally equivalent to northern latitude. This is an assumption that flowering plants are largely conditioned by heat. Thus latitude and oreographical habitats are more or less equal.

Might I introduce another element into this question? Seeing that temperature is so largely influential in explaining the distribution of flowering plants, it occurs to me that not only may height above the sea-level answer to northern distribution, but seasonal occurrence as well.

All botanists must have been struck by the fact that the earliest plants to bloom among our vernal flora are genera peculiarly Alpine. In some instances (as with *Chrysosplenium oppositifolium* and *C. alternifolium*) the species are identical. These latter plants blossom with us in March or April; within the Arctic circle not until June or July, and even so late as August. Thus, with them, seasonal blossoming is equivalent to northern latitude, as regards the thermal conditions under which they flower. The generic names of all our early flowering plants are those pre-eminently Alpine and Arctic in their distribution—Potentilla, Stellaria, Saxifraga, Chrysosplenium, Draba, Ranunculus, Cardamine, Alsine, &c. I contend, therefore, that our vernal flora is explained by the fact that their seasonal occurrence, as regards temperature, is equivalent both to height above sea-level and northern latitude. In every instance it will be found that the blossoming of the species of the above genera necessarily takes place, in Great Britain, two or three months earlier than within the polar circle. May we not therefore contend that we owe our English vernal flora to the same causes as distributed our English Alpine plants; and that they are

as much protected by being able to flower earlier in the year, as if they had been located on the top of high hills or mountains?

The power to endure cold and wet displayed by many members of our vernal flora is very remarkable. Thus *Ranunculus bulbosus* and *R. acris*, *Stellaria media*, &c., are frequntly found in flower all through the winter, unless the season be extra cold. Many other early bloomers among our common flowers are remarkable for their durability, whilst the late flowering plants are generally noticeable for the short space during which they bloom. This indicates a hardihood on the part of our vernal flora which cannot be explained except by reference to the climatal experience of the species. Some of them, as the groundsel and chickweed, may have exchanged an entomophilous for an anemophilous habit, or have become self-fertilised by the change.

Again, it must have been observed that many of our early flowering plants display a tendency towards a seasonable division of labour. All of them either flower before they leaf, or show a tendency to do so,as with coltsfoot (*Tussilago farfara*),the crocus (*C. vernus*),the snow-drop (*Galanthus nivalis*),&c. Even the violets (*Viola odorata* and *V. canina*), the daffodil, primrose, cowslip, &c., although they in part leaf when they flower, develop leaves much more abundantly after flowering than before, thus showing an inclination towards dividing the period of active live into two distinct stages—the productive and vegtative. Every one knows how completely this has been effected by the meadow saffron (*Colchicum autumnale*). My impression is that this early flowering tendency is a survival of the habit these plants had to blossom under more rigorous climatal conditions; in short, that our vernal flora must have the same origin assigned to it as an Alpine; that it has survived through being able to bloom at an early period of the year at low levels, instead of flowering at a later season higher up, above the sea-level; protection and advantage being secured in both instances.—*Science Gossip.*

Fall-blooming of Menyanthes trifoliata.—One who has herborized for twenty years or so, is never astonished at the freaks of autumnal blooming that flowers take. Every one has seen from time to time stray specimens of *Hepatica* or of the various species of *Viola*, while almost every year *Brunella*, *Achillea*, and the common dandelion, may linger into November. Usually such second efforts lack vigor, and often there are disturbances of the inflorescence. This October has been truly remarkable for the number and variety of such waifs, but if they were only the common loiterers I should not feel it worth while to note them. But to-day I saw a sight which was to me phenomenal—a swamp full of *Menyanthes trifoliata* in full bloom on the 23d of October! I donned my rubber boots and waded into the water, as I have often done in May, gathering

great handfulls of the flowers. I think they must have opened about a week ago, as the racemes had set fruit below. There were many budding clusters also. I account for this display by the fact that the swamp in question was reduced to dusty dryness by the long-continued drouth; this acted on the plants much as their normal winter rest. When followed by rain—flooding the marsh—and then by an extended period of warm weather, they burst forth into flower. A natural consequence, I should suppose, would be a dearth of my favorites next spring.—W. WHITMAN BAILEY, *Brown University*.

Tubers.—That the scales on the tubers represent leaves of the of aerial stems is well known. The study of the phyllotaxy of these subterranean leaves is quite as interesting as that of ordinary leaves. In examining all tubers of cultivated and wild plants that I can obtain, I find that a plant has the same arrangement of foliar organs on tubers that it has on the stem; and where two plans exist, the one at the base of the stem is the one followed by the tuber. Good examples are found in the potato, in which both leaves and scales are alternate; and in Helianthus doronicoides, L., and tuberous, L., where the leaves are opposite below and more or less alternate above, the scales on the tubers are opposite. In the latter species scales frequently subtend "knobs", the tuber branches, which are then opposite and themselves bear scales—the leaves of the branch. The dimerous whorls decussate on tubers as well as do those of the stem. Another interesting fact is the completion of growth as to length in the lower internodes of the tuber while the upper are still quite small—a characteristic of the stem. —AUG. F. FOERSTE, *Dayton, Ohio*.

Notes.—Teachers of botany may be interested in knowing, if they do not know already, that the now common Japanese *Ampelopsis* presents an excellent instance of a uni-foliolate compound leaf. The three-lobed, or sometimes barely lobed and dentate leaflet has all the appearance of a simple leaf, but falls off by a distinct articulation from the top of the extremely long petiole, which is apt to persist sometime thereafter.

In the analysis of *Heterocentron roseum*, of the order *Melastomaceæ*, students complain that they can not ascertain the name by the key in the School and Field-book of Botany. I find that the difficulty is in the statement that in that family the calyx is coherent with the ovary. In *Heterocentron*, so far as I have examined specimens, it is distinctly *free*. The ordinal characteristics given by LeMaout and Decaisne, give the alternative of free or coherent.—W. W. BAILEY, *Brown University*.

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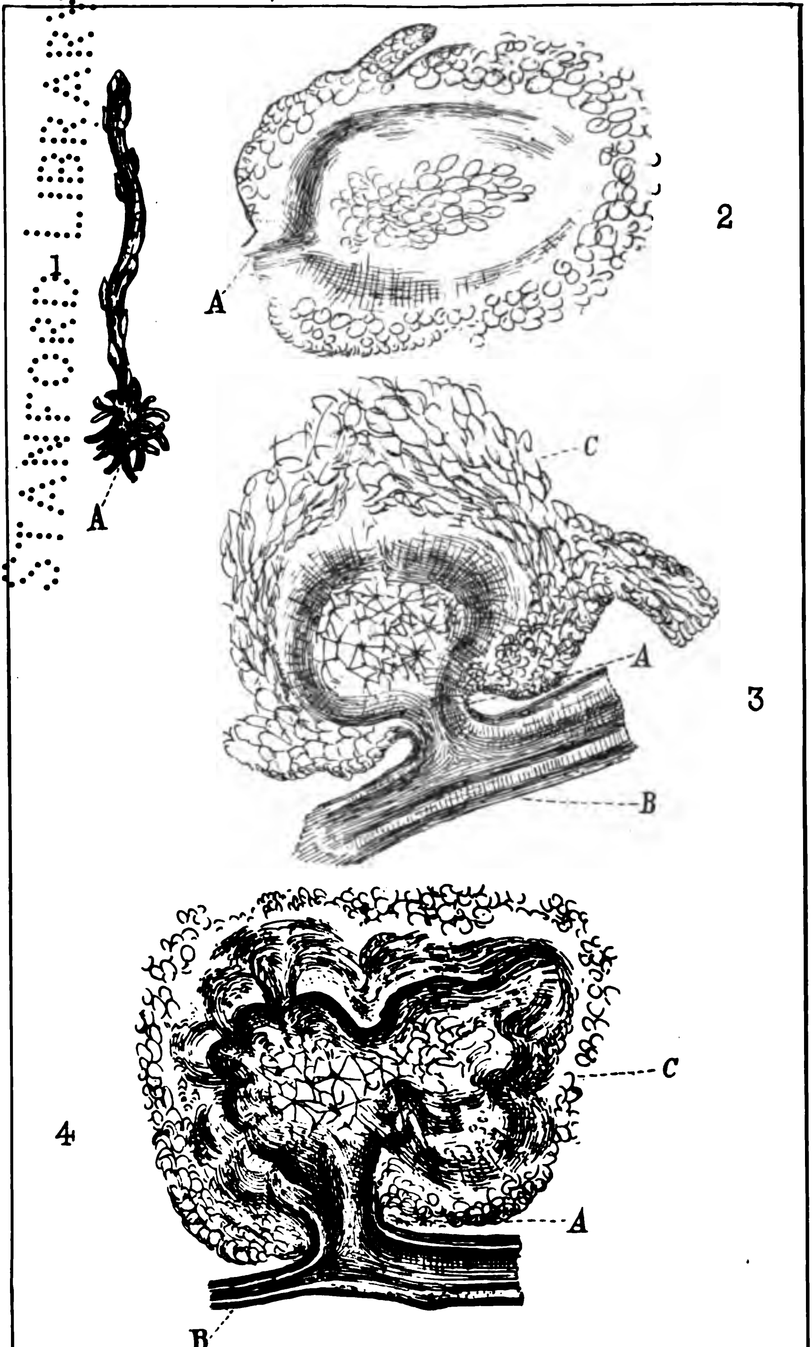

S. T. Fergus, del.

FERGUS ON EPIPHEGUS.

Botanical Gazette.

Vol. VIII. JANUARY, 1883. No. 1.

Some North American Botanists.

I. C. S. Rafinesque.

No name connected with American botany suggests greater possible success and more dismal actual failure than that of Constantine S. Rafinesque-Schmaltz. His ambition was his destruction, for it seemed to consist in establishing new genera and species and this he pursued so persistently that in his later years it became a monomania. His earlier writings contain real contributions to botanical science, but his later are simply collections of absurdities which if recognized at all would so cumber our synonymy that it would tend to make of it a hopeless tangle. And so this botanist of real genius, who boasted of having established over three thousand new genera and species, has his name attached to but a paltry dozen of genera in Gray's Manual, which covers nearly all the ground of his personal explorations. In his voluminous and scattered writings hundreds of pages must be read to find one which contains anything of value. Rafinesque should be held up before the young botanist of to-day as the type of a species-maker run mad, whose tendency was to so magnify every slightest deviation from the type that to him it meant a new genus or species. This statement finds it culmination in the paper which he sent to a well known scientific journal, in which he described in regular natural history style *twelve new species of thunder and lightning.*

The subject of this sketch was a Sicilian and first came to this country in 1802, remaining for three years, engaged in exploring our Atlantic slope, travelling on foot over much of the territory between Northern Pennsylvania and Virginia. In 1815 he returned from Europe and remained until his death, which occurred in September, 1840. During these 25 years he explored most indefatiguably from Vermont to Virginia and westward to the Wabash River. In 1819 he was appointed Professor of Natural Sciences in the University of Lexington, Kentucky, where he remained for seven years. In this time he claims to have explored that state thoroughly and made excursions into neighboring states north and south. During his last years he was engaged chiefly in exploring southern New Jersey and the pine-barrens.

Rafinesque has published quite an interesting autobiography, entitled, *A Life of Travels and Researches*, which contains much that is interesting, giving an account of his travels and well describing the discomforts and pleasures of the botanical explorer. The following extract from the introduction to his *New Flora of North America* will convince all of our collectors that the writer knows what he is talking about.

"Musquitoes and fleas will often annoy you or suck your blood if you stop or leave a hurried step. Gnats dance before the eyes, and often fall in unless you shut them; insects creep on you and into your ears. Ants crawl on you whenever you rest on the ground; wasps will assail you like furies if you touch their nests. But ticks, the worst of all, are unavoidable whenever you go among bushes, and stick to you in crowds, filling your skin with pimples and sores. Spiders, gallineps, horse-flies, and other obnoxious insects, will often beset you or sorely hurt you."

It is needless to say that the other side of the picture is also presented, and the pleasurable excitements of discovering "new things" well drawn.

It is difficult to enumerate the writings of Rafinesque, for they are so scattered throughout transient publications, that it is hard to know when all are counted and just as hard to find all that are known. In the *Am. Jour. Sci.*, Vol. 40, No. 2, 1841, is an article entitled, "Notice of the Botanical Writings of the late C. S. Rafinesque," written by Dr. Gray, and the acknowledgement might as well be made here that to it we are indebted for most of the information contained in this sketch. In the article referred to, Dr. Gray makes mention of nearly thirty titles which relate to botany, most of them however meaning not books but pamphlets.

Something now as to Rafinesque's methods in establishing new genera (which by the way he called genuses) and species. Those which he established upon personal observation are entitled to the most authority, but faulty partly on account of an ignorance of previous writings, but mostly because the slightest deviation in leaves made species and any change in floral organs led to the establishment of genera. His writings showed an appreciation of natural affinities and of the advantages of a natural classification, but the boundaries of a species or genus lay in an unknown region. He insisted that new species and genera are being constantly produced by the deviation of existing forms, which at length give rise to new species, and finally to new genera. This view was certainly in advance of his age and does great credit to his powers of observation. But he absurdly gave estimates as to the time in which these changes were made, stating that from thirty to one hundred years was the average time required for the production of a new species, and five hundred to a thousand years the time required for a new genus. Hence he thought that the business of establishing new genera and species would be endless, but he set himself manfully to work in his *Flora Telluriana* to establish 1000 totally new genera.

While a certain amount of patience can be retained in sifting his work upon forms which he himself saw and studied, this cannot be said with reference to his other work, for he had the pernicious habit of establishing genera and species upon descriptions and very imperfect descriptions too, of forms which he had never seen. For instance, his *Florula Ludoviciana* contains the descriptions of 30 new genera and 196 new species, not one of which had he ever seen, not one of which had even been collected, and all based upon the imperfect descriptions of a Mr. Robin, a man who did not know a *Ranunculus* from a *Polygonum*. The amusing part of it is that Rafinesque accepts Robin's identifications when there is no description, but whenever a few words of description are appended, the plant cannot be what Mr. Robin called it, cannot be anything before described, and hence must be a new genus or species. Thus he went to work upon the various writings of such botanists as Pursh, Nuttall, Elliott, Torrey, etc., and whenever they expressed any doubt as to the relationship of a certain form, a new species or genus would be established. Dr. Torrey's account of the plants collected by Dr. James, in Long's Expedition, yielded to the fertile imagination of Rafinesque 20 new genera! Dr. Gray mentions one instance he happened to know about, where our botanist mistook an undeveloped *Bupleurum* for a grass, and described it as a new genus of *Gramineæ*. Being told of his mistake he published it as a new genus "near to Bupleurum." He furnishes probably the only instance of a botanist persistently desiring to dedicate a genus to himself. The genus proposed just as persistently refused to stand and in despair he provides half a dozen Rafinesquias, from which botanists may take their choice. I know not whether his desire in this particular has ever been gratified. In the *Flora Telluriana* he begins in earnest the business of making genera, proposing, as has been said, to establish 1000 new genera. To give the cases referred to in the *Am. Jour. Sci.*; "*Allium* was divided into 15 genera; *Solidago* into 7, with about twice as many sub-genera; *Saxifraga* into 12 genera, which are placed in three natural orders, and two different classes; *Polygonum* into 23; *Gentiana* into 14; *Linum* into 34; *Hypericum* into 11; and *Salvia* into 14 genera absolutely, and 14 more proposed as doubtful or perhaps sub-genera." Of this whole regiment of genera marched to the front to stand the fire of criticism but 12, a corporal's guard, survive in the region covered by Gray's Manual, viz: *Adlumia*, *Polanisia*, *Cladrastis*, *Osmorrhiza*, *Lepachys*, *Erechthites*, *Ilysanthes*, *Blephilia*, *Peltandra*, *Clintonia*, *Diarrhena*, and *Eatonia*, and Bentham and Hooker have slain some of these. The fact is that Rafinesque's work is so unreliable that he has not even received the credit that he deserves, and some of his names ought to have been retained that were disregarded. Never was there a finer field open to the enterprising botanist than this country presented to Rafinesque when he landed here in 1802. No one made any

pretensions to such knowledge or ability as he possessed and the land was his "to enter in and possess." When he returned in 1815 the land was already partly possessed for Pursh, Nuttall, Elliott, Bigelow, etc., were at work. When we come to analyze the character of this eccentric man it seems as though the secret of all his eccentricity and cause of his failure to reach the rank for which nature had fitted him, was an unbounded egotism. Then, as now, there occasionally appeared one who preferred self to truth, even in communion with nature, who is the very embodiment of truth and is supposed to cultivate a love for it in her votaries. But the fact is scientific men are dreadful egotists and their own opinion is often worth a good deal more to them than the truth, and our estimate of Rafinesque is that he was simply an extreme and outspoken representative of a large class of scientific men to-day. And so he was ever working, but rarely accomplishing anything; always eager to publish, but his writings the rarest of all; anxious for his name to be remembered, but so using his talents as almost to bury himself and his works in a too harsh cond.mnation.

"Effort for selt ends aimlessly;
Effort for truth grows endlessly."

The Hibernaculum of Asarum Canadense, L.

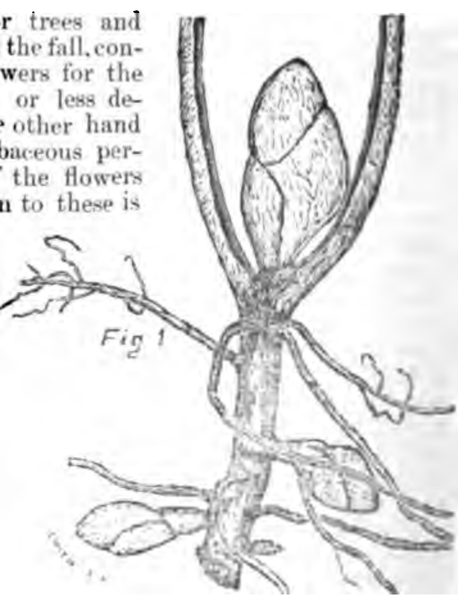

Fig 1

It is quite common for trees and shrubs to form buds during the fall, containing the leaves and flowers for the following year in a more or less developed condition. On the other hand it is very rare among herbaceous perennials to find any trace of the flowers until spring. An exception to these is our common Wild Ginger. On the 25th of November, I noticed in the garden of Mr. W. Werthner, that the creeping rootstocks had formed very flat buds which laid horizontally on the ground or were slightly covered by soil (Fig 1 and 6 B). He kindly permitted me to take the specimens. On the side of the bud towards the end of the shoot will be found a small ovate-oblong scale (Fig. 2). Follow-

Fig 2

ing this scale in alternating order will be found two more of the shape indicated in Fig. 3. All three scales are visible on any bud without dissection (Fig. 1). Within these are two leaves (Fig. 4) and in the center the flower bud (Fig. 5). The general arrangement of the parts can be seen in Fig. 6 A. The style (Fig. 8) is already quite well developed, the lobes and furrows being distinctly shown and the stamens (Fig. 9) contain the rudimentary pollen of the next year. The arrangement of the parts of the flower may be seen in Fig. 7. The buds are easily attainable in spring and it seems to me could be profitably used in the class room in comparison with the hibernacula of ligneous plants.—AUG. F. FOERSTE, *Dayton, Ohio*.

Fig 3

Fig 4

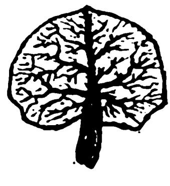

Fig 5

Fig 6

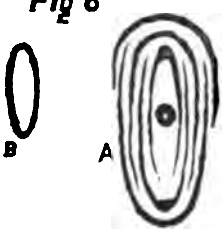

Fig 7

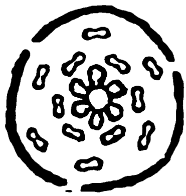

Fig 8.

X 8

Fig 9.

X 10

The Lignified Snake from Brazil.

It will be remembered that in the December GAZETTE a brief notice was given of what was described as being a lignified reptile. A tolerably full account of this phenomenon was given in the *Popular Science Monthly* and *Torrey Bulletin* for November, the account being the reproduction of one published in the French *La Nature* of last April. This account comes with all the authority of M. Olivier and the Botanical Society of France. It seems that the piece of wood containing the specimen is the property of Senor Lopez Netto, Brazilian Minister to the United States, who first took it to France but has it now in this country. After running the gauntlet of the scientists of Rio de Janeiro and the Botanical Society of France it has remained for our keen-sighted and quick-witted veteran botanist, Dr. Gray, to call in question its genuineness. Alas for the phenonenon that is not sure of its foundations when Dr. Gray lays his heavy hand upon it! Hear what he has to say about this latest "snake story":

"[1]Through the kindness of the Brazilian Minister, we have seen

[1] Am. Jour. Sci. Jan. 1883, p. 81.

and examined the original specimen, and have been presented with an electrotype of it. It is a great curiosity. The resemblance to a snake is wonderfully close, although "the scales and cephalic plates," which M. Olivier identifies with those of a particular Brazilian snake, exist only in a lively imagination. The snake-like surface is covered by delicate meshes of woody fibers; and here and there particular fibers or woody threads can be traced from the body to the woody surface.

The adopted explanation requires us to suppose that a snake had forced his way between the bark and wood of a living tree in a position exactly under a grub or larva; had perished there when within half an inch of its prey; was somehow preserved from decay, even to the eye-sockets and markings of the skin, until a woody growth had formed, the elements of which replaced the whole superficial structure of the animal,—until the animal was lignified! Two other and more probable explanations have suggested themselves. One is, that the snake-like body is of the nature of a root, an aerial root, like those of a *Clusia* or a *Ficus*, which was making its way between bark and wood; and that the supposed larva is an incipient root of the same kind. The other supposes that the sinuous course is the track of a wood-eating larva or some kind of insect, the burrowing of which had not destroyed the overlying liber: consequently the new growth filling the space (except at certain points) had naturally assumed the likeness of a snake. This explanation was suggested by Professor Wadsworth of Cambridge, examining the specimen along with the writer; and it is to be preferred. Still, that head and neck should be so well outlined, and the former so well represent a pair of orbits, were surely most wonderful. But a close inspection of the electrotype showed that there had been some cutting away at the right side of the neck, and that the narrowing there was in part factitious; and less decisive indications suggested that other outlines had been touched up. The subsequent inspection of the original confirmed this; and likewise enlightened us about the eyes. For the left orbit was found to occur, not in a woody structure, like that of the right side, but in a dark material having the appearance of pitch or cement of some sort.

We may rest assured that whatever there may be which is factitous in this most curious *lusus naturæ*, originated before it came into the hands of His Excellency the Brazilian Minister at Washington."

Epiphegus Virginiana.

(PLATE I.)

This little plant being somewhat remarkable in its peculiar way of living, we thought it might not be amiss to follow it in its career from infancy, on through its struggle for existence, to the maturity of its fruit, after which, when thousands of little seeds

are scattered, and having faithfully performed its allotted portion of duty, it quietly retires to rest.

The plant lives but a short time, perhaps not more than a month passing between germination and maturity. During this short time we must complete our investigations or remain as before in darkness as to how it came, how it grew and where it obtained its nourishment.

It has no true roots and does not contain chlorophyll, it therefore must be either parasite or saprophyte. It cannot live where there are no assimilating plants, this would indicate it being a parasite, which indeed it is, but a curious one. Having apparently no haustoria, the question arises, how then does it live? We know that this is a parasite. We know also that it lives extracting, or shall we say receiving nourishment from the beech, and from that alone. Sever its connection with the beech, that is, cut the beech root, on which it grows, carefully as you please, without disturbing the plant itself in the least, it will die; but dig it up, break off all its root-like appendages, but do not cut off the beech root, plant it again and it will live, grow, and ripen its seed. We say it is a parasite on the beech. How? We shall see. Here is a small plant not more than two inches high, less than one-fifth of the full size, growing among some half decayed leaves, or as frequently in soil where there is little or no vegetation but itself and the beech; we dig it up, carefully divest it of its coating of dirt, and we have something like Fig. 1, the lower part of the plant swelled out into a sort of bulb, and from this bulb protruding in all directions, a number of ramifications, in appearance, not unlike the horns of a deer, which for want of a better name we will call grapplers; these might be mistaken for roots but they are not, their use being to hold the plant firmly in the ground: this is probably all we will see, the beech-root having been broken off. To show that this is true, we cut several vertical slices from the bottom of the bulb, and place them under the microscope, somewhere on one of them will be seen (Fig. 2) a cluster of large cells, surrounded by a band of tissue, much finer, and of two different kinds, in which we find a cell formation closely resembling that of the beech, and not to be found in the upper parts of the parasite. (If the plant possess anything analogous to haustoria, it will probably be found in connection with the inner part of this band.)

We now select a larger plant, and find it attached to a larger root, perhaps a sixteenth of an inch in diameter, or more. The parasite has a tight hold with its grapplers, bending them over the root as if to hold it in position, this, however, being not always the case. We break the grapplers away, and find the bulb adhering to the side of the root as if glued; a thin slice and a microscope shows (Fig. 3) the beech root at B, and a portion of the parasite, C, looking very much as though the beech had reversed the order of things, and had grown into the parasite. But now we go further, and in the

same way examine another (Fig. 4); here the parasite is larger and requires more nourishment, consequently the root has changed its course, all the descending fluids passing into the parasite, while that portion beyond the parasite has dwindled down to less than half its former size; later it decays and falls away, leaving the whole root to the parasite, which is so well supplied that its cells always contain quantities of starch, while there is so much tannin in its juice, that a very good ink may be made by simply adding to it a small quantity of copperas, or sulphate of iron.—S. T. FERGUS, *West Chester, Pa.*

EXPLANATION OF PLATE I.—Fig 1. A young plant; the beech root was attached at A.

Figure 2. A vertical section from the lower part of Fig. 1. A, the point at which the beech root was attached.

Figure 3. Section through beech root, B, and parasite, C. The beech root healthy throughout.

Figure 4. Section through beech root, B, and parasite, C. The beech root at B in a dying condition.

Kentucky Fungi.

A sojourn of a couple of weeks at Norwood near Somerset, Pulaski Co., Kentucky, gave us thirty figures of fleshy or putrescent Fungi and upwards of fifty species of the more durable kinds, all new to our herbarium. We think we have five or six new species but these must remain awhile in the stocks to be well considered before being launched forth upon their independent being. New species of *Lactarii* are easy enough to find and Mr. Berkeley asserts that "the warmer states of North America abound with Lactarii quite different from the European species" but no one need expect to disentangle them unless he persistently *figures* and studies all the different forms he meets with. The same remarks apply to the *Boleti*.

It is not my purpose to catalogue everything observed, but merely to notice some of the more interesting species.

AGARICUS PALYPYRAMIS, *B. & C.* This is a large, coarse, heavy Amanita, the pileus studded with thick warts and the stipe rooting 3 or 4 inches into the ground. I find the spores subelliptic, with a slight oblique apiculus and measuring .009×.007 mm.

AGARICUS LEAIANUS, *Berk.* This beautiful Mycena of the Cincinnati Catalogue, seems to be abundant everywhere east of the Mississippi. Its spores measure .0090×.0056 mm.

AGARICUS FENZLII, *Schulz.*, var. My specimen is this species except the stipe in not "sulphureo." Annularias are extremely scarce everywhere. I have never known of any except A. lævis, Krombh., being found in North America before.

CORTINARIUS SQUAMULOSUS, *Peck.*, ranges from New England down here unchanged.

RUSSULA VIRESCENS, *Schaeff.* A new species to us and furnishes a beautiful figure.

LACTARIUS INDIGO, *Schw.* This is deep blue within and with-

out and exudes a blue juice. The spores are ochraceous, a little oblique and .007 mm. long.

LACTARIUS ICHORATUS, *Botsch.* This species, I believe, is new to the record in this country. We added six new figures of Lactarii to our collection.

BOLETUS PURPUREUS, *Fr.* All the Boleti furnish gorgeous paintings. This one is a brilliant red with white flesh changing to blue.

BOLETUS ——— near *Russellii*, Frost, but the spores are something enormous, measuring .018×.009 mm. It is awaiting Prof. Chas. H. Peck's determination.

BOLETUS RETIPES, *B. & C.* Mr. Berkeley would have better said *puberulent* than "pulverulent" in his description. I found no specimens with gray or brown pilei, so am disposed to consider *B. ornatipes*, Peck, a good species; nevertheless the two are very closely related. The spores are bright yellow, the same as the flesh. I give .011×.0056 mm. for their measurement.

FISTULINA HEPATICA, *Huds.*, might be found growing at the base of nearly every chestnut tree; the specimens were often perfectly magnificent. Dodham says "No fungus yields a richer gravy, and though rather tough, when grilled it is scarcely to be distinguished from broiled meat." We, however, would express a decided preference for Mrs. Lewis' broiled chicken.

HYDNUM. The species of this genus were very numerous; here is the list of conspicuous ones:

H. imbricatum, Linn.	H. repandum, Linn.
diffractum, Berk.	suaveolens, Scop.
infundibulum, Sw.	aurantiacum, A. & S.
velutinum, Fr.	cirrhatum, Pers.
zonatum, Botsch.	glabrescens, B. & Rav.
adustum, Schw.	flabelliforme, Berk.
coralloides, Scop.	

The specimens of most of these were very fine indeed; I never before saw such large *H. repandum*, Linn. A figure of one lies before me: the pileus measures 5½ in. across, the stipe is 3 in. long and 1½ in. thick. They evidently grow much finer down south.

CLAVARIA. Species of this genus were numerous; among them *C. rufescens*, Schaeff, with its rosy tips. *C. formosa*, Pers., I here saw for the first time.

SCLERODERMA GEASTER, *Fr.* We thought we had some new and singular Geaster; but a view of the large fluffy spores under the microscope immediately revealed a *Scleroderma*.—A. P. MORGAN, *Cincinnati, O.*

Notes from Franconia.

To a botanist who has to teach all the winter, the summer vacation offers especial charms. He plans out in the previous winter how and where he shall spend it, and furbishes up his armor and appurtences in the shape of *vasculum* and portfolio. My last summer

was spent in two very distinct regions, the Highlands of the Hudson, and the Franconia Valley of New Hampshire. At West Point I collected for about ten days and under the guidance of Mr. Edward S. Denton, visited some excellent localities. My friend showed me his corner for *Camptosorus rhizophyllus*, a wild nook on a mountain side amidst a confusion of boulders, and densely shaded with forest growth. Here in a perfect tangle of ferns we refreshed the inner man preparatory to a further jaunt. A mile's walk took us to the opening of the famed "ravine" on Crow's Nest, which, however, we did not ascend. As I have been familiar with it from childhood, I will say that it is one of the richest spots for collecting in that whole interesting region. In one scramble up the steep sides of the cascade, I have often found in May, *Sanguinaria Canadensis*, *Orchis spectabilis*, *Cypripedium pubescens*, *Asarum Canadense*, *Menispermum*, *Mitella diphylla*, *Allium tricoccum* and many other beauties. My father made a thorough study of this mountain, and his old copy of Bigelow, which I possess, is enriched with many notes and drawings of the plants there found. I saw at West Point this summer on the cliffs near the river, solid beds of *Opuntia* in full flower. Nothing could surpass the loveliness of their lemon-yellow blossoms. I collected *Ptelea trifoliata* for the first time, and imagine that this is rather far north for it to grow. *Vincetoxicum nigrum* was abundant in several places. Mr. Denton intended showing me the tamarack swamp, were he has found some rare things, but heavy rains interfered with our plans.

I arrived in Franconia about the 6th of July, and at once began to collect in that famed region. It goes without saying that it is surprisingly unlike my field here in Rhode Island. The absence of many familiar deciduous trees at once impressed me. There were no chestnuts or oaks, for instance, nor do I remember seeing a single hickory. In place of these were birches of all kinds, the paper-birch being especially conspicuous; spruces without end, and tall white pines that had I not seen the coniferous forests of the Pacific slope would have quite astonished me by their size. Even at this late date I was in time to collect *Linnea borealis*, and all summer long the pretty *Oxalis Acetosella* made the woods gay with its pink bells. By following up the Copper Mine Brook to Bridal Veil Falls, I could secure these spring flowers in all states of progress, the elevation giving a wide range of climatal conditions. Later, the beds of *Moneses uniflora* were simply ravishing. I found also a few specimens of *Pyrola minor*. I checked off during the summer in an old Manual the plants seen and identified, and have many as yet unstudied. This list, which is much too long for publication in the GAZETTE, I sent to the *Appalachian Club*. I was within easy reach of the famous Flume, of Echo Lake, Kinsman's Flume, and Mount Lafayette. I have already sent you a note concerning my red-letter day up among the alpines on this old monarch. I only regret that I did not spend a week near the summit,

for nearly everything I secured was precious.

I have for some time been especially interested in mosses, and here I found myself in their chosen home. They cushioned the rocks and trees, and often hung over the treacherous holes between the cliffs, drooping in masses like snow from the eaves of a house. They were embarassing from their multitude. Any one mat that was dug up contained always a number of species interlaced. I shall have work for months in disentangling and naming them.

These few notes, I am aware, contain no information, but are given in hope that they may serve, perhaps, to call up to the minds of some a pleasant picture of two beautiful regions. I hope others of your readers may yet have an opportunity to dwell, as I did, for two months, among these magnificient mountains, and to contribute a little more knowledge of a flora so rich and fascinating.

—W. W. BAILEY, *Brown University.*

GENERAL NOTES.

Lactuca Scariola, L.—I collected *Lactuca Scariola, L.*, in Cleveland, Ohio, August 11, 1882.—R. S. HUBBARD.

Gentiana crinita.—In the November number of the GAZETTE, Mr. Davenport calls attention to albinism in *Gentiana crinita*. I have several times in former years seen cases of this. One superb plant which I found near Diamond Hill, R. I., about two years ago, had thirty or more blossoms, all pure white. I have this year had a white specimen sent me from near Providence. I should have noticed these before, had I not in one instance, been informed that cases of albinism were too trivial to report. If so good a botanist as Mr. Davenport considers them of consequence, I shall at least be in excellent company.—W. W. BAILEY, *Providence, R. I.*

Lactuca Scariola, L.—Mr. Foerste's suggestion, in the November No. of the GAZETTE, respecting the probability of this plant being naturalized in Wisconsin, had already been verified. In Aug. 1880, I met with it, well established, along a road side, in Mukwanago, about 40 miles west of Milwaukee. In August of last year, I found it growing in abundance along R. R. tracks and upon the banks of the Maumee River, in the City of Toledo, O., and, in October last, I again met with it, growing near the Cattle Yards, at East Buffalo. To all these places it had evidently "come to stay." Doubtless, however, it had reached E. Buffalo as an adventive from the West.—DAVID F. DAY, *Buffalo, N. Y.*

Ejection of the Seed in Cereus Emoryi, Engelm.—I have a plant of *Cereus Emoryi* which produced last summer three flowers at the apex of a previous year's stem. Not being familiar with the species, the

specimen received almost daily attention. One morning a stream of black seeds was found to have been ejected from the apex of an erect fruit, and had coursed down the sides and over the brown spiny surface like a stream of lava from the top of a burning mountain. The placentous mass ejected with the seeds, hardens soon after ejection, and holds the seeds in place. The other two seed-vessels behaved in the same way, but in order to note what else might occur to favor the distribution, the seeds have been left in the channels of the dry streams until to-day—two months. The process of expulsion and the precise objects to be gained by this method, must be left to further investigation.—THOMAS MEEHAN.

Alaska Ferns.—The following species are to be added to the list previously published in the GAZETTE (Vol. VII, p. 96.) and belong to the same collection made by Mr. Turner on the Island of Unalaska, in 1879–80 and 81. The sheets containing them having been placed in another part of the package were overlooked when preparing the first list for publication.

15. *Adiantum pedatum*, L. Specimens characteristic.

16. *Phegopteris polypodioides*, Fee. Specimens very pubescent and scaly along the rachises. Some of them more rigid than eastern specimens and with different aspect, but a close examination fails to reveal any real difference in character.

Still another sheet contained quite a number of specimens of *Polypodium vulgare* showing considerable variation. GEO. E. DAVENPORT, *Medford, Mass.*

Sound of Discharging Ascospores.—In collecting *Peziza pubida* this summer, I happened to place a box-full in the sunshine, when they began discharging the spores with a distinct and very peculiar fizzing noise, somewhat like the noise of soda-water. I tried many specimens with the same result. I have found no other species that exhibit this phenomenon. In *Science Gossip* for December 1871, however, there is an article on *P. aurantia* from which I quote the following: " * * * I blew upon another, and found that about a second after I had blown upon it, it showered out, if I may so say, in all directions, chiefly around the edge. I did this repeatedly, and found that after they had been left five minutes or so, the same effect followed about a second after they had been blown upon;and what surprised me still more was, that several times, the "shower" in issuing forth *made a distinct sound*, which I cannnot better describe than as a slight fizz." My specimens, collected here, supposed to be *P. aurantia*, do not exhibit this peculiarity. E. W. HOLWAY, *Decorah, Iowa.*

Marked Protandry.—In passing through the greenhouse last spring my attention was caught by the very marked protandry of the flowers of the Lemon-scented Pelargonium, *P. graveolens*, of the gardeners. On the large potted plant observed the flowers were in all stages of anthesis

and all the changes undergone by the stameus and style were clearly shown. The stamens are of very unequal lengths,the three superior ones(1, 2, 1, Fig.)being the shortest and united by their filaments. The two inferior (4, 4, Fig.) are longest and the remaining ones (3, 3, Fig.) intermediate in length. Two of the missing stamens are represented by sterile filaments but there is no trace of the inferior one (?, Fig.). While the anthers are bursting the five stigmatic surfaces are closely pressed together. So perfect is the protandry that the anthers shrivel and drop off and the filaments wither and curl up before the stigmas are exposed. In rare instances one or two shriveled anthers persist until the style begins to open.--C. R. B.

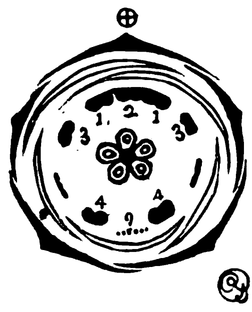

Diagram of flower of *Pelargonium graveolens*. Stamens numbered in the order of their length 4 being longest.

EDITORIAL NOTES.

PROF. C. E. BESSEY, with his family, is spending the winter in the east. Another botanical text-book will doubtless be the product of his freedom from class-work.

ILLINOIS INDUSTRIAL UNIVERSITY has quite a well organized Natural History Society. The programme for 1883, just received, shows one meeting, that of April 7, devoted to a botanical topic, viz: "Notes on Mosses," by Mr. A. B. Seymour.

E. RAY LANKESTER upholds in a vigorous article in *Nature* the view formerly fully presented by him in a memoir in the *Quart. Jour. Micros. Sci.* that the Chlorophyll corpuscles of Hydra are truly Chlorophyll corpuscles and not Unicellular Algæ.

MR. A. H. CURTISS is now at work preparing his sixth fascicle of Florida plants, to be issued in February, which he expects to be more valuable than any of the preceding ones, and will contain very nearly all the South Florida plants which he has not previously distributed.

HENRY JOHN ELWES has published in London a most elaborate monograph of the genus *Lilium*, bearing the date of 1880. It is an Elephant folio and is one of those sumptuous volumes which are more apt to be published across the sea than here. Every species known to the author is figured, in natural size and colors, making 48 full-page plates.

WE WERE GUILTY of a little injustice in the December GAZETTE in speaking of Mr. Frank Bush's "Flora of Jackson Co., Mo.," when we wrote that the name of the state only appeared in the imprint. As

we said, it does not appear upon the title page, nor in the introduction, but we find that it is prominent enough at the top of every page of the text.

DR. BERGMAN concludes from his researches that formic and acetic acids are found in all parts of plants as constituents of the protoplasm and are to be regarded mainly as decomposition products, resulting continually from metastatic changes. An increase in the amount of these acids takes place whenever light is withdrawn unless the temperature is lowered at the same time to the minimum required for growth.

DR. FRED. BRENDEL of Peoria, Illinois, has just published a treatise upon the topography, climate and vegetation of Illinois, which also contains a Catalogue of the Flora around Peoria. This is an imperial octavo of 107 pages, but as it is in German, and printed at Buda-Pesth, and is a part of the fifth volume of the *Termeszetrajzi Fusetek* (whatever that may be), American botanists will not be apt to get much good of it.

IN THIS NUMBER of the GAZETTE is begun a series of short biographical sketches of some North American botanists of the first half of the century. Many botanists, who have not access to large libraries, feel an interest in knowing more about those whose abbreviated names are of such familiar occurrence in our manuals and a wider knowledge of the history of botany and the personality of botanists will help us all.

MR. J. G. BAKER has prepared a paper on the flora of Madagascar, recently read before the Linnean Society. It contains descriptions of 140 new species of *Polypetalæ*. Some of the genera are widely diffused throughout the tropics; others are of temperate types; others are characteristic of the Cape flora; and a new genus is allied to the American *Hiræa*; and some characteristic Australian genera are present by their representatives.

A. ERNST writes to *Nature* from Caracas about an abnormal fruit of *Opuntia Ficus-Indica*, which had developed wholly inclosed in one of the flat branches. He also inclined to believe that what is taken to be the pericarp of the *Opuntia* fruit is nothing but a slightly modified branch, bearing the ovary of the flower in a cavity on its upper end. If this is true *Opuntia* can no longer be described as having an "exerted ovary," as the latter is sunk in the interior of a branch.

IT HAS BEEN recorded by Dr. Brandis, Director of the India Forest Department, that *Acacia dealbata* introduced into India from Australia in 1845 has gradually changed its time of flowering from October, the Australian spring, to June, the corresponding spring month in India. In 1850 the tree flowered in October, in 1860 in September, in 1870 in August, 1878 in July and in 1882 in June. Mr. Dyer notices this fact in *Nature* and adds the statement that *Acacia decurrens*, var. *mollis*, a close-

ly allied species and one observed by Sir Joseph Hooker to flower in Tasmania at the same time as *A. dealbata*, has during its cultivation in England since 1790 changed its time of flowering from May-July to February. The influence of their environment upon the blossoming of these trees seems quite marked.

M. LEPLAY of the Paris Academy of Sciences has read a paper upon a chemical study on maize. He states that sugar is found in the leaves, and accumulates in the stem till the moment of formation of starch in the grains. It then migrates into the spike, first into the support of the grains, then into the grains themselves, where it is replaced by starch. This migration continues to be fed by the leaves till they disappear, then in great part by the stem, diminishing, however, as the starch is developed. The function of the sugar, then, is to furnish to the grain the elements of starch.

MR. WM. M. CANBY has observed that the tips of the leaflets of *Akebia quinata*, a plant twining over a trellis near his porch, dripped moisture enough to make the floor look as if sprinkled. Mr. Meehan has followed up these observations and found no constancy nor periodicity in the exudation, nor, indeed any external circumstances which induce it. The same observer detected a similar exudation from the pistil just before the expansion of the flower and also among the petals in the bud which soon disappeared. In *Thuja* also there is a sudden appearance of a small globule at the open mouth of the naked ovule. Sachs suggests that in Coniferæ the use of this exudation is to catch the pollen and as it sinks within the vesicle carries the pollen grains to the nucleus and fertilization is effected by actual contact.

WE ARE SURE that the friends of the GAZETTE will be gratified at the evidence of progress shown by this initial number of Vol. VIII. The new arrangement of matter into distinct departments, with some additional pages and a greater range in type, nearly doubles the capacity, and in our opinion we now present to our patrons as large and neatly printed a periodical as can be issued at the present low rate of subscription. The editor also takes pleasure in announcing in this formal way, what all have seen upon the title page, that with the new volume there will be associated with him Professor Charles R. Barnes, of Purdue University, and Prof. J. C. Arthur, of Charles City, Iowa. All who are acquainted with these gentlemen will testify to the fact that no better selection could have been made, and that their vigor of thought and action will constantly be felt in the pages of the GAZETTE.

DR. A. L. CHILD records in the *Popular Science Monthly* some observations upon the relation between the so-called "annual rings" of trees and the known age. His attention was called to the matter by the statement of M. Desire Charnay that in a shrub which he knew to be on-

ly eighteen months old he counted eighteen rings of growth. In 1871 Dr. Child planted some seeds of *Acer rubrum*. In transplanting in 1873 the trees were set too close and had to be thinned. In each of four of these trees when they were cut down in 1882 he counted from 35 to 40 separate rings. In three of them twelve rings were plainer than the rest, while in the fourth, nine were large and the remainder not distinguishable from each other. All of these saplings were of known age. Certainly if 35 or 40 rings may be made in twelve years, the estimates of age based on the number of growth rings cannot be very accurate. The rings varied in thickness from 2½ to 28 mm.

DR. CHAS. MOHR has been looking up the rare *Rhus cotinoides*, Nutt., for the Tenth Census. It has been lost to the botanical world for forty years and was poorly understood. After considerable search the tree was found where Prof. Buckley had found it in 1841. Its habitat seems to be upon the southern declivities of mountains along the valley of the Tennessee in Alabama and probably extending northward into the State of Tennessee. Dr. Mohr reports it as yielding a yellow dye-stuff and formerly much used for that purpose in the neighboring settlements. On account of the great beauty of its wood the tree is called by the negroes Shittim-wood, they believing that it is the very wood so named in the Bible. "The wood permits of the finest finish; the fineness of its grain, beauty of color and its hardness fit it well for inlaid work, veneering, and the manufacture of smaller articles of all kinds of fancy woodwork." An interesting account of this re-discovery is given in Proc. Philad. Acad., p. 217, 1882.

CURRENT LITERATURE.

Descriptions of New Species of Fungi, collected in the vicinity of Cincinnati. By THOMAS G. LEA, and described by REV. M. J. BERKELEY. Republished from "A Catalogue of the Plants of Cincinnati, by Thomas G. Lea."- This important pamphlet has just been published by the Cincinnati Society of Natural History. Thos. G. Lea's "Catalogue of Plants" was published in 1849, the collections having been made during the years 1834 44, but it has become so exceedingly rare as to be virtually inaccessible to students. This was to be regretted principally on account of its containing a list of Fungi with notes and descriptions of the new species by the eminent English mycologist, Rev. M. J. Berkeley. This loss has now been generously made good by the Society referred to, and this neat pamphlet of 21 pages is hailed with delight by more than the local mycologists. The richness of Mr. Lea's collections may be inferred from the fact that out of a list of 80 species 51 are new, and one of them was made the type of a new genus, *Psilopezia* by name. The Cincinnati Society of Natural History has quite an enterprising set of members, who are well cultivating many departments, not even neglecting, as is seen, this much neglected branch of Systematic Botany, and they promise to publish during this present year a synopsis of Hymenomycetes of the Miami Valley, by Prof. A. P. Morgan.

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Some North American Botanists.

II. John Torrey.[1]

John Torrey was born in New York City, Aug. 15, 1796. His father, originally from New England, was a Captain in the Continental army and was among those who entered the city upon its evacuation by the British forces.

Of the boyhood of Dr. Torrey we know but little; he attended the public schools and was for a year at a school in Boston.

When a mere boy, while upon a visit in the country (the upper part of Manhattan Island was then "the country,") he saw two young men pass along the road, all travel-stained and laden with strange parcels. The unusual appearance of these young men prompted him to inquire about them, and he was told that they were "the Le Conte boy" and another whose name is forgotten, and that they were "botanists." Young Torrey for the first time saw a botanist, and he looked upon him as a curiosity, little thinking that he himself would in time be a chief among botanists. The "Le Conte boy" afterwards became the celebrated Major Le Conte, who contributed largely to botany and other sciences.

While still a youth it was Dr. Torrey's fortune to be brought into relations with Amos Eaton, who was the great instructor in popular science of his day, and it was through his teachings that he first learned the rudiments of botany.

Up to the time he became a medical student we know but little of his career. He had a marked natural talent for practical mechanics, and at one time seriously entertained the idea of becoming a machinist. He ultimately chose the medical profession and entered the office of Dr. Wright Post, the eminent physician and surgeon of his day.

Either during his apprenticeship, as it was then called, or after he entered the college of Physicians and Surgeons, he was an interested attendant upon the botanical lectures of the eminent Dr. Hosack, at the Elgin Botanical Garden. At that time young Torrey was an industrious collector and often carried to Dr. Hosack the fruits of his herborizations.

As a medical student Dr. Torrey must have devoted much

[1] An abridgement of a biographical sketch by Dr. George Thurber, prepared by the Editor of the *Bulletin of the Torrey Botanical Club.*

time to botany, as his "Catalogue of the Plants growing spontaneously within thirty miles of New York" was presented to the Lyceum in 1817, which was a year before he took his degree.

While yet a student of medicine, Dr. Torrey was one of the founders of the New York Lyceum of Natural History and, during its early career, was one of its most active members and contributed to its Annals many of its most important papers. In this mention of the Lyceum it may be well to state that by acting as its curator a young botanist from Western New York was enabled to pursue his botanical studies in New York. This young botanist is now known as Prof. Asa Gray.

After obtaining his medical degree, Dr. Torrey took an office in New York City, but the attractions of botany, mineralogy, entomology and chemistry prevented him from applying himself seriously to practice.

Soon after he was graduated, the expedition of Maj. Long was proposed, and Dr. Torrey was offered the position of botanist. He was greatly tempted to accept this opportunity for botanical distinction, but he had formed ties which were strong enough to keep him at home. Dr. Baldwin was appointed in his place and upon the death of Baldwin, who was an almost hopeless invalid from the start, the duties of botanist were performed by the surgeon of the expedition, Dr. James.

In 1820, Dr. Torrey published in Silliman's Journal "A Notice of Plants collected by Capt. N. Douglas around the Great Lakes at the Head Waters of the Mississippi.

In 1823, he contributed to the Annals of the Lyceum of Natural History "Descriptions of some new or rare plants from the Rocky Mountains, collected by Dr. Edwin P. James."

In 1824 he published "A Flora of the Northern and Middle States, or Systematic Arrangement and Description of all the Plants heretofore discovered North of Virginia." In this year he was married to Miss Eliza Robinson Shaw, and was settled at West Point as Professor of Chemistry in the U. S. Military Academy. This Flora, the concluding pages of which were written on the morning of its author's wedding day, is now rare, a large portion of the edition having been destroyed by fire. It contains over 500 species and includes the first twelve classes of the Linnæan system. In this work the author first manifested his acuteness in diagnosis, and it is remarkable for its elaborate and minute descriptions.

In this same year, 1824, we find "Descriptions of New Grasses from the Rocky Mountains" in the Annals of the Lyceum, and a "Monograph of the North American species of Carex," of which he was joint author with Schweinitz. Schweinitz had placed the paper in Dr. Torrey's hands, to edit and supervise the printing of it, during the author's absence in Europe. When Schweinitz found how much the value of his monograph had been increased by additions and revision, he insisted that Torrey's name should

appear as joint author, and that it should be quoted as Schweinitz & Torrey.

Foreseeing that the Linnæan system was to be supplanted by one founded upon a more profound knowledge of the structure of plants and broader views of their relationships, the Flora was not continued beyond its first volume, but its author, in 1826, published a Compendium which contained condensed descriptions of the plants enumerated in the first volume of the Flora and of those that would have been given in the second volume.

In 1826, Dr. Torrey read before the Lyceum "Some Account of a Collection of Plants made during a Journey to and from the Rocky Mountains, in the Summer of 1820, by Edwin P. James, M.D., Assistant Surgeon, U. S. Army." This memoir was not published until 1828. Before its publication its author, after three years' service, left West Point to assume the chair of Chemistry and Botany in the N. Y. College of Physicians and Surgeons. This account of Dr. James's Rocky Mountain plants is of especial interest as being the first botanical publication of importance in this country in which the plants were arranged according to the Natural System. Shortly before, the Abbe Correa had arranged a list, in which the genera named in Muhlenberg's catalogue were placed according to the system of Jussieu.

In 1831, Lindley's introduction to Botany was re-published in this country. Dr. Torrey prepared a catalogue of the North American genera, arranged according to Lindley's orders, which was published with the work and also separately in the pamphlet form.

Dr. Torrey was always fond of studying obscure and difficult orders, hence the Borraginaceæ, Chenopodiaceæ, Amarantaceæ, and Cyperaceæ had particular attractions for him. As early as 1836 he published in the Annals of the Lyceum his "Monograph of the Cyperaceæ." This contained, besides a full account of the other genera, a complete revision of the genus Carex, and was a most valuable contribution to North American botany, as it contained an elaboration of the species collected by Drummond, Richardson, Burke, aud other British collectors, whose specimens were loaned by Sir William Hooker.

The Geological Survey of the State of New York was organized in 1836, and Dr. Torrey was appointed as its Botanist. His report, which was published in 1843, forms two enormous 4to volumes, filled with detailed descriptions of all the plants known to belong to the State, and is illustrated with 161 plates. When we consider that this work was produced amid the labors of his professorship at the Medical College, to which had been added those of the Chair of Chemistry at Princeton, we must wonder at the untiring industry of its author.

The first number of the "Flora of North America, by John Torrey and Asa Gray," appeared in 1838, the fruit of a most happy

association, which continued for over forty years, and which has done so much for the advancement of American botany.

The question why was not Torrey and Gray's Flora completed, has often been asked by those not familiar with the rapid progress of botanical discovery. The reason was this: By the time the first volume of the Flora was finished, new materials belonging to the orders contained in that volume demanded a large appendix, and a few years later new discoveries were so numerous that it was impossible for the work to keep pace with them. Its authors pursued the best course; instead of giving their time to the completion of the Flora and allowing the new materials to pass—as they inevitably would have done—into the hands of European botanists, they turned their attention to studying and recording them. Now these discoveries of American plants are mainly recorded by American botanists in American publications, and to secure this result it was well that the Flora was suspended. In this matter—of securing the new plants—both Doctors Torrey and Gray worked, sometimes together, oftener independently, but always with the fullest co-operation. The result has been a series of memoirs unequalled in scientific value by any that have been produced in recent botanical litarature. In chronological order we find that Dr. Torrey published in:

1843, Botany of Nicollet's Report;
1845, Botany of Fremont's 1st and 2d Expeditions;
1848, Botany of Emory's Military Reconnaissance;
1850, A Memoir on Batis. A Memoir on Darlingtonia and Plantæ Fremontianæ were accepted for the Smithsonian Contributions and published a year or two later.
1852, Botany of Stansbury's Report of his explorations in the region of Great Salt Lake;
1853, The Plants of Marcy's Red River Expedition;
1854. Botany of Sitgreave's Zuni and Colorado Journey.

The reports of the collections of the various Pacific Railroad surveys were published at intervals from 1855 to 1860, and then not in the order in which they were written.

Enumerating them as they occur in the volumes, we find in Vol. II: The Botany of Pope's, Beckwith's and Gunnison's expeditions, three comparatively brief memoirs in which Dr. Gray's name is mentioned as joint author.

Vol. IV: " Botany of Whipple's Expedition," the most important of all these Railroad surveys in botanical results.

Vol. V: "Botany of Lieut. Williamson's Report."

Vol. VIII: "Botany of Lieut. Parke's Expedition."

In other volumes of the railroad surveys are botanical reports by Newbury, Durand and others, to each of which Dr. Torrey contributed important materials, in many cases working up whole orders.

1861. The Report of Lieut. Ives' Exploration of the Colorado was published with a Botanical Appendix, mainly by Dr. Torrey.

The Report upon the Botany of the Mexican Boundary was published in 1859, the most voluminous, as it is the most important, of all these contributions to the botany of the far West. The survey was, on account of various changes, prolonged over a period of five years or more; it passed over a vast territory, which, for the most part was botanically new. Parry, Wright,. Bigelow, Schott and Thurber all contributed their collections to make up this exceedingly valuable report, one which may fitly close the record of Dr, Torrey's more important contributions to science.

After the Report of the Botany of the Mexican Boundary was completed, Dr. Torrey transferred his invaluable herbarium and his library to Columbia College. As regards this herbarium, no other collection contains so many typical specimens from which the original descriptions were drawn. After it had been transferred to its new quarters it needed re-arrangement. Specimens had accumulated more rapidly than they could be disposed of, and all those collected by the recent expeditions had to be incorporated with the general herbarium. For several years succeeding the publication of the Report of the Mexican Boundary, Dr. Torrey was employed in herbarium work. No hand but his could properly perform this scientific drudgery, and he went at it with a perseverance that in time brought it to completion.

During these years of herbarium work, necessary though irksome, he was constantly examining plants and making sketches that might be useful thereafter. It was a peculiarity of Dr. Torrey that he always recorded his observations by means of the pencil, and if we look through the herbarium there will be found drawings of minute structure by hundreds, giving at a glance what he saw in examining a plant. While he published no drawings as his own, we can find traces of his handi-work all through the illustrations to his various memoirs.

The last important botanical contribution of Dr. Torrey was "The Revision of the Eriogoneae," the joint work of himself and Dr. Gray, published in the Proceedings of the American Academy in 1870.

Many years ago he elaborated that portion of the collections made upon the Pacific coast by the botanists of Wilkes' expedition. This, through the failure of appropriations, was not published upon its completion. One of the last acts of its author's life was to look over the manuscript of this report and commit its final revision for publication to Dr. Gray.

The fondness of Dr. Torrey for sciences other than botany has been already alluded to. At one time he was an enthusiastic student of entomology, or, as he expressed it—he "had the fever."

At one time he gave much attention to mineralogy, a pursuit in which he was often associated with another botanist—Nuttall.

The earlier volumes of Silliman's Journal contain important contributions to mineralogy from his pen. Mineralogy is so intimately related to chemistry that he retained through life a lively interest in this department of science.

Those who have regarded Dr. Torrey as a botanist only, will be surprised to know that the avocation of his life was that of a chemist, and that the works that have made him an undying name in science were done in what he regarded as his hours of recreation.

During the last years of his life he held the position of Assayer in the U. S. Assay office in New York, and this connection with the Treasury Department had one happy result. Although he had done so much in describing and naming the plants of the far west, he had traveled but little: he "had never seen a prairie," as he was once heard to say with a tone of sadness, and had never ascended a mountain higher than Mt. Marcy. It was a graceful act of the Secretary of the Treasury to send him in 1865 upon a confidential mission to California. He went by the way of the Isthmus and was able to see and enjoy the luxuriant vegetation of the tropics, and, when he reached his destination, was met by an order to make some extended explorations, for the accomplishment of which a revenue cutter was placed at his command. While in California he was able to see many of the plants he had described growing in their native localities, and to make considerable collections for the herbarium.

In 1872 he made another journey to California, this time by railroad. Upon his return journey he tarried awhile among the Rocky Mountains and ascended Torrey's Peak, which was several years before thus named by his former pupil, Dr. Parry. It is pleasant to think of him as passing the last days of his botanizing, in the evening of his life, among the alpine plants which in his youth he first made known to the botanical world.

Neither this last journey to California nor one made the previous winter to Florida served to arrest the disease which those who saw him only at intervals could perceive was gradually wasting his body, though it did not dim his intellect or impair his cheerfulness. At sunset on the tenth of March, 1873, he peacefully went to his rest.

Some Notes from Freshmen.

Professor W. J. Beal, of the Agricultural College, Lansing, Michigan, has just sent to us a few notes taken from the theses of his Freshmen. During a term of 12 weeks, when they begin daily lessons, each one writes a thesis on topics like those given below. A few hints are given directing the student how to proceed. After

making his observations, experiments, and notes, each student, usually alone with the teacher, gives the main points for his thesis. He may make additions before writing out the whole. These are read before the class and credit is given for the work. Of course more advanced students perform higher work.

What we need is just such information as is contained in this set of notes, and information as to methods in all of our botanical laboratories would be of great service to those of us who teach, for we must keep comparing notes in order to arrive at the most improved methods of training pupils. The notes from some of the theses of Dr. Beal's Freshmen are as follows:

THE TENDRILS OF VIRGINIA CREEPER.—J. A. DART tied weights to two old tendrils and found one sustained six pounds, another six and one-half pounds. A common sized tendril sustained five pounds. They were fastened to a high board fence. On a brick wall two large tendrils held five and six pounds respectively. The main stem of a vine six feet long contained twenty-five tendrils another contained twenty. One branch three feet long had twelve tendrils and supported 35 pounds. Some main vines have no tendrils, and the branches but few. There is quite a difference in vines about the number of tendrils and their capacity to stick to objects.

FERTILIZATION OF CATALPA SPECIOSA, WARDER.—E. S. ANTISDALE studied insects on the flowers of *Catalpa speciosa.* The flowers are too large for fertilization by honey bees or small humble bees. Their backs will not reach high enough to touch the stigmas and anthers. A large humble bee touches stigmas and anthers going in and out of a flower. The broad stigmas, before noticed by others, are sensitive and close in a few seconds after they are touched, close before a bee backs out of the flower. He covered up several panicles of flowers with mosquito netting. No bees were placed inside of two of these. Small humble bees were placed in a third sack containing flowers on which the bees were seen to work. No fruit set on any of these three. In the fourth net large humble bees were placed, but they failed to work on the flowers, and no fruit set in this case. In several flowers not covered with netting he saw a large humble bee working and watched it as the back was dusted with pollen and the stigmas closed. He marked three of these flowers, two of which set fruit.

ÆSTIVATION OF FUCHSIAS.—R. C. WILLIAMS examined the æstivation of 65 flowers of cultivated Fuchsias and made diagrams of all the forms. The sepals were all valvate. The petals were arranged in 45 different ways, several variations of the convolute prevailing. Some were reduplicate in whole or in part.

INSECTS CAUGHT BY APOCYNUM.—H. T. FRENCH examined insects about *Apocynum androsæmifolium* where they went for pollen and nectar. They are often caught while backing out of the bell-shaped flower. There are five wedge-shaped grooves made by the filaments—the larger part of the groove is at the base of the

corolla. One fly twisted his head off in the attempt to get away. Many small bees got caught, and mosquitoes too, quite often two to a flower. They are held by the tongue or the legs. Honey bees are large enough to escape or pull out. He could not discover that the capturing of flies or bees was of any advantage to the plant.

How the Seeds of Stipa are Planted by Nature.—Jesse J. Beal dropped about 20 fruits of *Stipa spartea* on a box of sand. The fruit has a long awn which is straight when wet and twisted when dry. Half the grains were dropped on sand where straws were stuck in every inch or so in every direction, the other half were dropped on sand without any straws or other objects on the surface. The grains were each held by the tip of the awn about as high as the plant grows, and each went down like an arrow, large end first, and all stuck in the sand but one. They were alternately wet and dried by sun and rain. They all bored into the sand except one. They went down just as well where there were no straws as where there were straws.

Flowering of Timothy.—E. C. Bank observed in cool damp weather, beginning June 29th, that a spike of timothy (*Phleum pratense*) put forth flowers (stamens) for ten days in succession, except none on the ninth day. In another place, in warmer weather, beginning July 15th, spikes put forth stamens for eleven days. Most flowers appear during a few days of the middle of these periods.

The Climbing of the Wild Morning Glory.—E. T. Gardner observed the wild morning glory (*Calystegia sepium*) and as in former years some dozen specimens were found twining the wrong way, following the course of the sun. A smooth post two inches in diameter was about as large as the vine would ascend.

Structure and Growth of the Cell Wall.

Prof. E. Strasburger's most recent publication is a work of 264 pp. entitled, "Ueber den Bau und das Wachsthum der Zellhaute" (On the Structure and Growth of the Cell-Wall). The book contains some most interesting contributions to our knowledge of the origin and growth of the cell-wall and starch grains, the function of the nucleus and the assimilation of carbon, and, based upon our previous knowledge and the author's investigations, offers some important theories in regard to the molecular structure of organized bodies.

So worthy of notice are some of the results at which he has arrived that we reproduce from the *Jour. Roy. Mic. Soc.* a summary of the salient points of the book, as follows:

With regard to the intimate structure of organized bodies,

Prof. Strasburger entirely dissents from Naegeli's micellar hypothesis. This hypothesis was based upon the phenomena of "swelling up" which are so characteristic of organized bodies, and upon the optical properties which certain of these bodies possess. Prof. Strasburger points out that swelling up may be as well ascribed to the taking up of water between the molecules of the body as to its being taken up between Naegeli's micellae. He shows also that the double refraction of organized bodies, such as cell-walls, and starch grains, depends upon their organization as a whole; for when once their organization is destroyed, their double refraction is lost, a result which cannot be explained on the micellar theory, since the particles of the disintegrated micellae would, like particles of broken crystals, still retain their power of double refraction.

According to Strasburger the molecules of an organized body are not aggregated into micellae which are held together by attraction, but are linked together, probably by means of multivalent atoms, by chemical affinity, in a reticulate manner. Swelling up is then the expression of the taking up of water into the meshes of the molecular reticulum, where it is retained by the intermolecular capillarity. The more extensible the reticulum, that is, the more mobile the groups of molecules within their position of equilibrium, the greater the amount of swelling up. The limit is reached when the chemical affinity of the molecules and the force of the intermolecular capillarity are equal; if the latter exceed the former at any moment, the result is the destruction of the molecular reticulum, or, in other words, of the organization. Protoplasm differs from other organized bodies in that the grouping of its molecules is undergoing perpetual change, the result of this molecular activity being the phenomena which we term vital. The growth in thickness of cell-walls and starch grains takes place, according to Prof. Strasburger, by the deposition of successive layers; in opposition to Naegeli's view, that the mode of growth was intussusceptive. with subsequent differentiation of layers. Even the surface growth of cell-walls is not, in his opinion, intussusceptive, but is merely due to stretching.

With reference to the mode of formation of the cell-wall and of the thickening layers, Strasburger agrees with the view of Schmitz that the cell-wall is formed by the actual conversion of a layer of the protoplasm, that is, chemically speaking, by the production of a layer of cellulose from a layer of proteid. When a mass of protoplasm is about to clothe itself with a membrane, the peripheral layer becomes densely filled with minute proteid bodies, the microsomata, and this layer then becomes converted into cellulose. The wall of a young wood-cell of *Pinus*, for instance, is clothed internally with a layer of protoplasm filled with microsomata, which are arranged in spiral rows; the microsomata then gradually disappear and the layer of protoplasm is found to

be replaced by a layer of cellulose, which presents spiral striation corresponding to the previously existing rows of microsomata, and which constitutes a thickening layer of the cell-wall. In cells the walls of which become much thickened, the whole of the protoplasm may be gradually used up in this way. Again, the wall of pollen-grains and of spores is formed from a peripheral layer of the protoplasm which contains abundant microsomata. Its subsequent growth, and especially the development of the asperitus which it commonly presents, is effected by the surrounding protoplasm which is derived from disorganized tapetal cells; this is especially well shown in the development of the epispore of *Equisetum* and of *Marsilia*. When an intine or endospore is present it is produced like the outer coat from a peripheral layer of the protoplasm of the pollen-grain or spore. Further, the septum which is formed in the division of a cell is produced in the same way.

The cell plate, like the peripheral layer of the protoplasm of a young pollen grain, contains microsomata which disappear, and it is then converted into a plate of cellulose. Finally, the successive layers of a starch grain are produced by the alteration into starch of layers of proteid-substance derived from the starch-forming corpuscle (amyloplast).

Professor Strasburger next points out that the starch which makes its appearance in the chlorophyll-corpuscles under the influence of light, is derived from the proteid of the corpuscles by dissociation. The formation of this starch is therefore not the immediate product of the synthetic processes going on in the chlorophyll-corpuscles, but only a secondary product. The processes in question produce proteid. Prof. Strasburger is inclined to accept Erlen Meyer's hypothesis that methyl aldehyde is formed in the chlorophyll-corpuscles from carbon dioxide and water, and to believe that by polymerization a substance is produced which can combine with the nitrogenous residues of previous dissociations of proteid to reconstruct proteid. He does not agree with the suggestion of Loew and Bokorny that the methyl aldehyde may combine with ammonia and sulphur to form proteid *de novo*.

Lastly, Prof. Strasburger makes a suggestion as to the probable physiological significance of the nucleus. He points out that the nucleus cannot be regarded as regulating cell-divisions; for instances are known of cell-division taking place without previous nuclear divisions, and conversely, of nuclear-division taking place without cell-division. He is of opinion that the nucleus plays an important part in the formation of proteid in the cell. This view is founded upon the fact that one or more nuclei have been found to be present in the vast majority of plant-cells, that the nucleus is, as a general rule, the most persistent protoplasmic structure, and that it gives the various proteid reactions in a very marked manner.

GENERAL NOTES.

Liquid exudation in Mahonia.—"The same observer detected a similar exudation from the pistil"—in *Mahonia*, the itemizer should have added. See p. 163, line 20.—T. M.

Some California Plants.—On the last day of the old year the following plants were in bloom under three inches of snow in the vicinity of Oakland:

Ranunculus Californicus	Boisduvalia densiflora
" Bloomeri	Œnothera ovata
*Eschscholtzia Californica	*Cotula coronopifolia
Cardamine paucisecta	*Grindelia robusta, var.
Lepigonum macrothecum	Wyethia helenoides
Claytonia perfoliata	Troximon grandiflorum
Erodium cicutarium	Megarhiza Californica
Lupinus Chamissonis	Garrya elliptica
Vicia Americana, var.	Solanum umbelliferum
Lathyrus vestitus	Cynoglossum grande
Fragaria Californica	Castilleia foliolosa
Rubus ursinus	Scutellaria tuberosa
Ribes Menziesii	*Umbellularia Californica
* " sanguineum	Dirca occidentalis

The asterisk marks species usually in bloom by Christmas. *Eschscholtzia*, *Cotula* and *Grindelia* are everblooming. *Claytonia* and *Erodium* are annuals. Besides these plants, "hold-overs" of the dry season, such as *Solidago*, *Aster*, *Gnaphalium*, etc., were seen in bloom. The introduced weeds *Raphanus*, *Brassica*, *Capsella*, *Anagallis*, *Urtica urens*, etc., were plentifully in bloom. Our first rains were followed by unprecedentedly warm weather which lasted till near the middle of December. Since Christmas it has been remarkably cold.—VOLNEY RATTAN, *San Francisco.*

Plantago pusilla, Nutt. The ordinary form of Missouri and Illinois, where it is common, and as far as I can see of the Eastern States, where it is much rarer, has linear or filiform entire leaves, scapes 2 to 4 or rarely 6 inches high, obtusish or subacute bracts of the length of the orbicular sepals and short oval slightly exsert capsules, 4 seeds about 1.3 mm. or 0.6 line long.

Var. MACROSPERMA is a larger form, 4 to 7 inches high, with longer, much exsert capsules; seeds nearly twice the length of the last, 2.4 mm. or 1.2 lines long.—Saline soil of the western plains; on the Shienne River, *Nicollet*, and near the mouth of the Yellowstone River, *Hayden.*

Var. MAJOR, much larger and stouter, leaves lanceolate-linear, often 1¼ to 2 lines wide, the larger ones laciniate with few long teeth or lobes; scapes densely woolly at base, with the elongated spike often 9 inches high; bracts acute, longer than the sepals; seeds intermediate in size between the two other forms.—Near Atoka, north of Red River in the Indian Territory, *G. D. Butler.*

Dr. A. Gray thinks that he has proofs that this species, or probably the second form of it, is the lost *P. elongata*, Pursh, Fl. Suppl. p. 729,

but even if so, Nuttall's name, now well known since more than 60 years, ought to be retained in place of a doubtful and very inappropriate one.—The three closely allied species, *P. Bigelovii* and *P. pusilla* with 4 seeds, and *P. heterophylla* with numerous ones, have all pitted seeds, well seen only in perfectly mature specimens. The seeds become gelatinous when wet. G. ENGELMANN.

Forest Fires in Oregon.—The forests of Eastern Oregon are found only at an elevation of 3,500 to 4,000 feet and upwards. Fires, when the growth is thick, as it commonly is, destroy everything. The first plant to occupy the land is *Epilobium spicatum* (called "Elk Weed" here). This seems to be the only herbaceous plant to follow the fires. In a year or so the ground is occupied by seedlings of the same species that covered it before, viz: Black Pine (*P. contorta*, var.) and Red Pine (*Pseudotsuga*); also, in about their usual proportion, the three or four other coniferous species common to this region. The youug growth is commonly very dense and grows rapidly. In 15 or 20 years the saplings will be 20 to 30 feet high and 2 to 4 inches in diameter, the pine occupying the ground mostly.

In Western Oregon it seems to take more time to replace the destroyed forests. The trees are much larger and are slower to decay. The ground is soon covered by a thick growth of blackberry plants (*R. ursinus*) and also raspberry, the latter more scattering. With these the seedling forest trees have to contend. But in time they overcome them and occupy the land exclusively, as did their ancestors. In the coast mountains there appears to be an exception to the rule that the burned forest is soon replaced by young trees of the same species. There is a large section of the country lying between the Willamette Valley and the Gaquinna Bay in wich the forest growth, which must have been very thick, has been entirely destroyed. This region is now thickly covered by a growth of Cherry (*P. emarginata*), which occupies the land to the exclusion of almost everything else. The thick growth no doubt preventing, as it apparently has done for 40 or 50 years and seems likely to for all time to come, the young conifers from getting a hold.—WM. C. CUSICK, *Union, Oregon.*

Elastic Stamens of Urtica.—The curious discharging of pollen by the elastic stamens of *Pilea microphylla*, Liebm., the "Artillery plant" of our window gardens, coupled with the text-book assertion that in the sub-order *Urticeæ* the filaments are "transversely wrinkled and inflexed in the bud, straightening or spreading elastically when the flower opens," are reasons enough for expecting a forcible discharge of pollen in our common nettles. This discharge seems to take place only under the most favorable circumstances however, for a long observation of the nettles failed to reveal any extraordinary phenomena. It was a pleasant surprise to suddenly observe last fall a huge plant of our common *Urtica gracilis* enveloped in a shower of pollen. The plant grew on heavy muck.

and was consequently growing rapidly. The day was excessively hot and sultry, a thunder shower having passed but a short time previously. The discharge of pollen was so copious as to attract one's attention for several rods. By examining the flower buds with a glass the tips of the sepals could be seen to gradually spread apart, to be in two or three minutes suddenly laid open by the straightening of the stamens. Usually two opposite stamens would straighten at the same time, though often but one at a time. Frequently all four would pop out of their cramped position at once. The anthers opened simultaneously with the liberation of the stamens, and the pollen was thrown five or six inches. The stamens straightened themselves to a perfectly horizontal position, the filament usually twisting half or a quarter way round at the same time. The stamens on a severed branch of the plant continued to open elastically for five or ten minutes. Subsequent observations after showers in warm weather when the plant was growing vigorously often revealed the pollen discharge, but in very much less quantity and vigor than in the first case. The phenomenon could never be observed in *Urtica dioica*. No doubt proper culture in a hot-house would discover our common nettle to be one of our most interesting plants, at least much more so than the little *Pilea*!—L. H. BAILEY, JR., *Cambridge, Mass.*

C. S. Rafinesque. The generally accepted impression that he was a Sicilian is probably incorrect. At least he tells us in his "*Life and Travels*," "I was born at Galeta, near Constantinople, inhabited by Christian merchants and traders, my father being a French merchant of Marseilles."

In addition to Rafinesque's genera "in the region covered by Gray's Manual," *Pachystima* may be added, discovered since the last edition of the Manual appeared, though not the species on which the genus was founded.

When I was a young man in Philadelphia, thirty years ago, some of Rafinesque's contemporaries were still living. His chief home was here, and here in a dingy garret, with scarcely a loaf of bread to eat, he worked for science, as he understood it, to the last. He died on a cot with hardly a rag to cover him, and without a solitary friend to stand by him in his last hours. Bringhurst, a kind hearted undertaker, committed his body to the earth, and for years a pine board with "C. S. R." was all that marked his last resting place.

From all I have been able to learn from those who knew him, and from what I have been able to gather from his writings, the summary in the GAZETTE scarcely does him justice, though perhaps justified by the statements heretofore published by those who had but imperfect knowledge of the man. It can scarcely be said of him that "he preferred self to truth" in the common acceptance of these terms. He endured rarely paralleled misfortunes, and sacrificed a large fortune for the sake of science, and it is doubtful if what the world understands as "truth" was ever sacrificed to anything by Rafinesque. His remarks on

his contemporaries were often sharp, and naturally excited aversion, and perhaps to this aversion we may refer some of the omission to receive as much credit as might be his due. But he often speaks admiringly of those he had lanced, and it is evident that, unwise in his discourtesy, it was not at any rate engendered in malice.

But he made species? Not long ago I read the introduction to a work in which the author complained that of some hundred or more species he had described, a contemporary had done him the gross injustice of not leaving him a dozen! It is no uncommon fault.

And he was an egotist? But I have lived to learn that in this respect at least "every man has his price." Let us meet in spirit around his unhonored grave in old Ronaldson Cemetery, remembering his sacrifices, grateful for what he did, and tried to do, and not forgetting that we too are but human as was he.—THOMAS MEEHAN.

EDITORIAL NOTES.

IT MAY SEEM to some that we have departed somewhat from the natural order of things in selecting Dr. Torrey as the subject of the second sketch in our series of "Some N. Am. Botanists;" but we are compelled to publish these sketches, not as we would, but as we can.

THE AMERICAN MONTHLY MICROSCOPICAL JOURNAL begins the new year with S. E. Casino, of Boston, as publisher and every evidence of prosperity. When an editor can be relieved from all clerical work his literary work is that much better and we now expect from Mr. Hitchcock a journal even more entertaining than it has been.

PROFESSOR G. MACLOSKIE, of Princeton, presented at Montreal a paper on "Achenial Hairs and Fibers of Compositæ," which now appears illustrated in the *Naturalist*. The object of his study seems to have been an attempt to discover some additional tribal characters, a thing very acceptable in this large and very homogeneous order. If the characters from the achenial hairs, etc., prevail it will necessitate considerable readjusting of tribes, "yet the parallelism between the structure of the hairs and the affinities of the groups, as founded on other characters, is singularly complete."

DR. L. ERRERA finds glycogen in the tissues and asci of ascomycetous fungi and also in *Linum* and *Solanum*. He has established completely the identity of the glycogen in *Peziza vesiculosa* (which he has studied most closely) and that of the mammalian liver. When not in too small quantity plant glycogen may be detected by its reaction with iodine, giving a brownish red color which disappears on heating and reappears on cooling. The discovery of the existence of this carbo-hydrate in plants breaks away another of the attempted absolute distinctions between plants and animals. Glycogen seems to perform the same functions in both organisms.

PROFESSOR DOUGLASS H. CAMPBELL, of Ann Arbor, has been showing the development of the male prothallium of *Equisetum arvense*, and recommends its use by laboratory students as a plant that is

common and very satisfactorily studied. The growth of the fertile plant is very rapid, making the cells large and distinct. Besides, "the spores germinate very readily if sown immediately after maturing, and offer a most interesting example, in their development, of the growth and division of cells. Within a few weeks of sowing, the antheridia are produced abundantly, containing antherozoids of extraordinary size, much larger than those of the mosses and ferns."

F. PAX, after describing in detail instances of phyllody of the carpels of *Aquilegia vulgaris* and *formosa*, states as his opinion that the two integuments of the ovule are equivalent to a leaflet. He also shows the identity of this leaflet with the pinnule of the fertile frond of a fern and in the following table expresses the homology of the parts:—

Fern.	*Ovule.*
Spore.	
Macrospore.	Embryo-sac.
Macrosporangium.	Nucellus.
Sorus,	Several nucelli.
Pinnule.	Ovular leaflet.

WE HAVE RECEIVED an advanced copy of the report of the Professor of Botany and Horticulture of Michigan State Agricultural College. Every botanist knows that this Professor is Dr. W. J, Beal, one of the most successful teachers of botany in this country. Dr. Beal's methods of instruction are widely known through the publication of a paper prepared by him entitled "The New Botany," a paper which has gone into the general circulation which it so well deserves through its republication by Chas. Marot, of the *Gardener's Monthly*. The report just received shows not only Dr. Beal's methods of instruction, but, what is a considerable solace to some of us, the means at his disposal. Finely equipped as he is with natural gifts, these are supplemented by appliances which are exceptional in the West, botanic garden, greenhouses, and *time* furnishing splendid opportunities for studying botany in the only right way. To those of us having no greenhouses, no botanic garden, and only about 30 hours all told, and those in a season when nature's botanic garden makes very little display, Dr. Beal's account of his methods was rather discouraging. This report shows that the author is a very busy man, but as all this hard work has brought success, he is rather to be envied than pitied.

PROF. J. C. ARTHUR has made an interesting discovery in the study of the Schweinitzian species and specimens of microscopic fungi, which throws considerable light upon what was very perplexing before. In several cases no ingenuity could make the Schweinitzian specimens agree with the descriptions undoubtedly based upon them. One illustration used is that of *Uromyces Lespedezæ*, which Schweinitz described as having two-celled spores and hence included under *Puccinia*, when every student knows that the spores are unicellular. Prof. Arthur was much puzzled over such discrepancies until it occurred to him to consider the microscopes and methods of manipulation which were used by the author in question. This at once furnished the key to the riddle, for putting some dry spores of the fungus mentioned upon a slide and using

a half-inch objective, they all appeared two-celled, owing to the thickening of the apex, which often occupies half the length of the spore. This furnishes us another way of explaining the discrepancies of authors of an earlier day, without blaming them either with carelessness or wilful misrepresentation.

ARTICLES IN JOURNALS.

ARTHUR, J. C.—Interpretation of Schweinitzian and other Early Descriptions, *Am. Nat.* XVII, p. 77.

BAKER, J. G.—A Synopsis of the Genus Selaginella, *Jour. Bot.* XXI, p. 1.

BANNING, M. E.—Preservative for Fungi, *Torr. Bull.*, IX, p. 153.

CAMPBELL, DOUGLASS H.—Development of the Male Prothallium of the Field Horsetail (with two plates), *Am. Nat.* XVII, p. 10.

DYER, W. T. THISELTON.—The Sacred Tree of Kum-Bum, *Nature*, XXVII, p. 223.

FORBES, F. BLACKWELL.—On the Chinese Plants collected by D'Incarville (1740–1757), *Jour. Bot.* XXI, p. 9.

GRAY, ASA.—The Lignified Snake from Brazil, *Am. Jour. Sci.*, Ser. 3. XXV, p. 79.

GREENE, E. L.—Note on Holozonia filipes. (Completing the generic description.) *Torr. Bull.* IX, p. 145.

GROVES, HENRY and JAMES.—Notes on British Characeæ, *Jour. Bot.* XXI, p. 20.

HOLLICK, ARTHUR.—Flora of Richmond Co., N. Y., *Torr. Bull.* IX, p. 149.

KUNTZE, OTTO.—Cinchona Ledgeriana a Hybrid, *Jour. Bot.* XXI, p. 5.

MACLOSKE, G.—Achenial Hairs and Fibers of Compositæ, *Am. Nat.* XVII, p. 31.

MASTERS, MAXWELL T.—Double Flowers. (Especially with reference to specimens of *Tetrotheca ciliata*. Comment on Grant Allen's statement that petals are in all probability originally enlarged and flattened stamens.") *Nature*, XXVII, p. 126.

MEEHAN, THOMAS.—Historical Notes on the Arbor Vitæ, *Proc. Acad. Philad.* 1882, p. 110: Liquid exudations in Akebia and Mahonia, l. c. p. 113: Heliotropism in Sunflowers, l. c. p. 222.

MOHR, CHAS.—Rhus cotinoides, Nutt. (An account of its rediscovery.) l. c. p. 217.

PETERS, DR.—The Female Flowers of Coniferæ. (Resume of discussion between Eichler and Celakovsky.) *Nature*, XXVII, p. 231.

PLOWRIGHT, C. B.—On the British Bramble Phragmidia. *Sci. Gossip*, No. 217, p. 11.

RANSOM, ARTHUR.—The Fertilization of Speedwell. (Criticisms on Stapley *infra*.) *Nature*, XXVII, p. 149.

SCRIBNER, F. L.—List of Western Grasses. *Torr. Bull.* IX, p. 145.

STAPLEY, A. MACKENZIE.—The Fertilization of Speedwell, *Nature*, XXVII, p. 127.

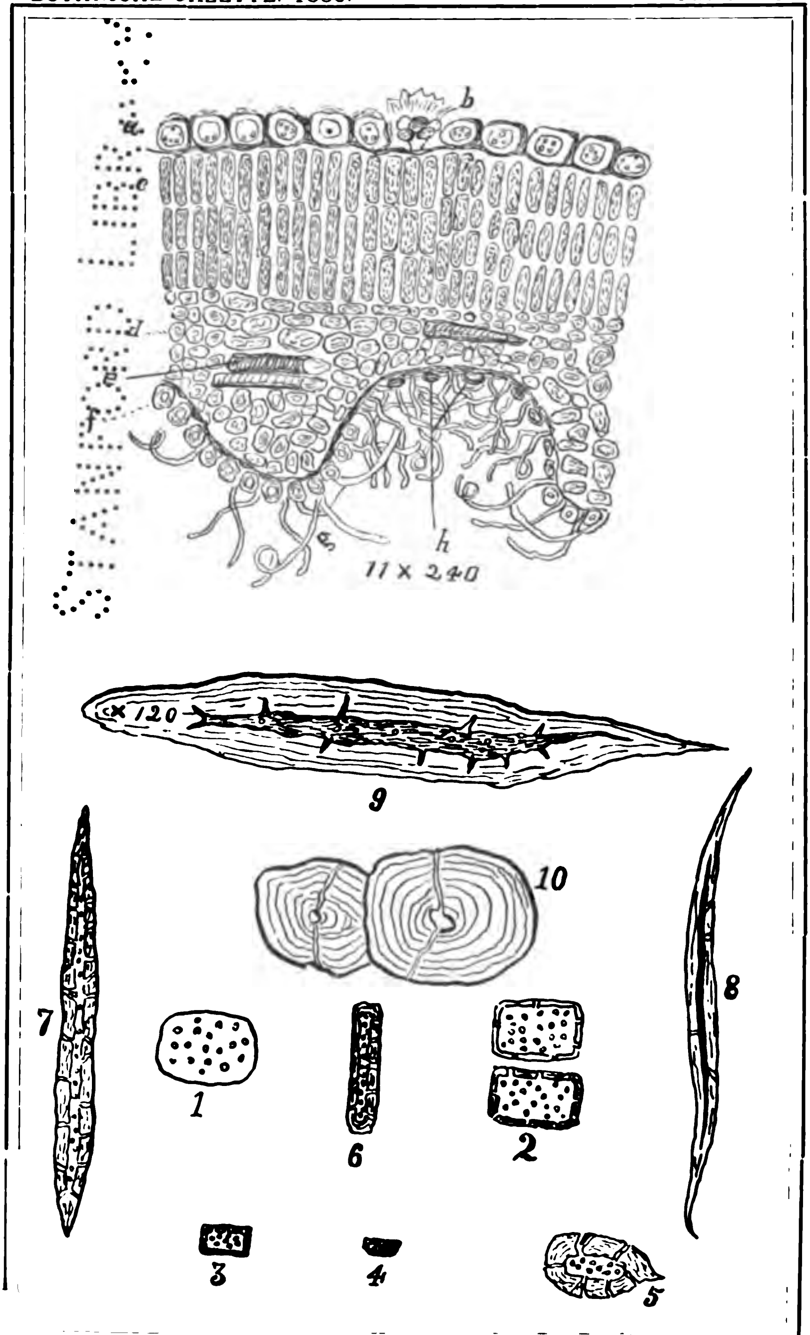
WAGER, JOHN.—The Danish Forest, I. *Sci. Gossip*, No. 217, p. 14.

WALLACE, ALFRED RUSSELL.—Debt of Science to Darwin, *Century*, XXV, p. 420.

WATSON, SERENO.—A Monograph of the Genus Lilium. (A review of H. J. Elwes' Monograph.) *Am. Jour. Sci.* Ser. 3. XXV, p. 82.

WRIGHT, S. H.—A New Variety of Carex riparia, *Torr. Bull.* IX, p. 151.

YOUMANS, E. L.—Use of Gummy Secretions of Plants. (Editorial note de[illegible] investigations.) *Pop. Sci. Mo.* XXII, p. 572.



ROTHROCK ON ERIODICTYON.

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Some North American Botanists.

III. Andre Michaux.

The "elder Michaux," as he is called, has the double distinction of publishing the first Flora of North America, and of being the most indefatigable explorer this country has ever seen. Although he has left his name as author upon but two works, his numerous discoveries have furnished the basis of other publications. The work referred to besides the Flora of North America is a "History of North American Oaks," and neither of these were published till the year of the author's death, the former being edited by the eminent botanist Louis Claude Richard and the latter with the help of the son, F. A. Michaux. The whole object of Michaux's existence seems to have been to transplant to France from all quarters of the globe every species of plant that could be made useful, and presently this desire settled into such an eagerness for travel that he was never at rest, except by compulsion, and probably traversed more territory than any other botanist. An outline of his life is as follows: He was born in Versailles, March 7, 1746, and received his botanical education under the great Bernard de Jussieu. His first visit was to England; then several trips to the mountains of Auvergne, to the Pyrenees, and into Spain. From 1782 to 1785 he was in Persia in a political capacity, but really to explore a country that was then almost unknown to scientific men, and returned home with a large collection. The French government having become interested in the subject of introducing into France such exotic trees as would be useful in shipbuilding, Michaux was chosen to visit the United States, with a commission to send to France all the trees he could obtain. In September, 1785, he embarked with his son at L'Orient and arrived at New York on the 13th of November. He remained in this country until 1796, when he embarked from Charleston, S. C., for Amsterdam, but was wrecked on the coast of Holland. In this shipwreck it is stated, in the *Annales du Museum d'Histoire Naturelle*, that "Michaux was lashed to one of the yards, and was senseless when carried on shore," not recovering till some hours afterwards. His first thought was for his collections of ten busy years and he was gratified to learn that some of them were saved. "His plants having got wetted by the salt water, he was obliged to immerse them all in fresh water, and one

after another, to dry them between new papers." For three or four years he remained at home cultivating the plants he had forwarded from the United States and arranging materials for the volumes which were subsequently published. In 1800 he joined the expedition to Australia, under command of Captain Baudin. He became disgusted with his commander and abandoned the expedition at Mauritius, but soon went to Madagascar. There he established a botanical garden in which to cultivate his collections, but soon fell a victim to the unhealthy climate, and died with fever November 13, 1802.

Of course among American botanists the interest in Michaux centers about his travels in this country, which are said to have aggregated over 3,000 miles and this is probably very scant measure. In some respects he was more favorably situated for exploration than other botanists, for he was in the employ of a government that provided liberally for his needs; but while still at work here the revolution overtook France and Michaux was forgotten. In these circumstances he used his own means until they were exhausted and he was compelled to return home. The mere enumeration of his trips in this country would more than exhaust our space and the most important only can be given. He early established two botanical gardens, one in Bergen Co., N. J., and the other near Charleston, S. C.; the former to receive his collections from New Jersey, Pennsylvania, and Maryland; the latter those from the Carolinas and the southern Alleghany Mountains. It was from this Charleston garden probably that some exotics have spread and become naturalized in the Southern States, as for instance *Albizzia Julibrissin*. In April, 1787, Michaux set out upon his first journey to the Alleghany Mountains, going up the Savannah river to its sources, crossing the mountains and reaching the waters of the Tennessee. Thence he returned to Charleston, where he arrived in July. His next exploration was in East Florida, in the spring of 1788. In the autumn of the same year he again took a trip to the sources of the Savannah to obtain seeds and roots, the *Magnolia cordata* being the principal object of his search. The following winter was passed in the Bahama Islands. In June, 1789, he started to visit the mountains in North Carolina, ascending Black, Roan, and other mountains of that now famous region. Pushing across the mountains he descended the Tennessee side, with the intention of penetrating into Kentucky, but was prevented by the danger from Indians, and so contented himself with an exploration of the mountains of Virginia, crossing the wild regions of West Virginia along New River, etc. Finally he entered Maryland and reached Philadelphia by way of Lancaster, Penn. Going to New York he returned to Charleston through the lower grounds. In November of the same year he again explored the mountains of North Carolina. In 1792 he is recorded as botanizing in New Jersey and around New York. Thence up the Hudson to Albany,

and so on about Lake Champlain, reaching Montreal June 30, 1792. From Montreal he proceeded to Quebec, and thence by the Saguenay to Hudson's Bay, where, he says, "naught but a dreary vegetation was found, consisting of black and stunted pines, which bore their cones at four feet only from the ground." Returning to Philadelphia he proposed to Mr. Jefferson, then Secretary of State, to explore the country west of the Mississippi to the sources of the Missouri, and even to the Pacific waters, for the sum of £3,600. This was a bold proposition and one that was acted upon a few years later in the expedition of Lewis and Clark, but Michaux was never permitted to make the journey. In July, 1793, he started for Kentucky, descnding the Ohio to Louisville and then back across Kentucky, West Virginia, and Virginia, to Philadelphia. Early in 1794 another extensive tour was made in the Southern States and the North Carolina mountains, and in 1795 the same trips were continued to Knoxville, Tenn. Thence he crossed the Cumberland Mountains and came to Nashville, and so on to Louisville, ascended the Wabash River to Vincennes and thence westward to the Illinois River and down it to the Mississippi and lower part of the Ohio. Ascending the Ohio and Cumberland, after many hardships, for it was midwinter, he finally reached Nashville and started for the Carolinas in February, 1796, stopping for a while again in his favorite North Carolina mountains with his favorite guide, Davenport, reaching Charleston in April. It was in August of this year that he embarked for Amsterdam and was shipwrecked.

Very many of our species of plants bear the familiar abbreviation "Mx." or "Michx." and not a few genera own him as their author, such as *Micranthemum*, *Elodea*, *Dichromena*, *Oryzopsis*, *Erianthus*, etc., etc. Unfortunately, the genus which commemorates him is one he discovered in Persia, and so his name cannot in this way be associated with North American botany, for which he did so much. His flora of North America contains, exclusive of non-vascular Cryptogams, but 1530 species, under 528 genera, just about the numbers which appear now in our numerous state catalogues, but of this number a very large proportion were new. Although but eleven years in this country he has left a deeper impression upon North American Botany than many a distinguished botanist has in a life time, and most surely gained the distinction of being *facile princeps* among our botanical explorers.

For further and more particular information concerning Michaux the reader is referred to the *Am. Jour. Sci.* 1.9.266 (Dr. W. J. Hooker "On the Botany of America"); 1.42.2 (Prof. Asa Gray on "Botanical Excursion to the Mountains of North Carolina"); 2. 24.161 (Elias Durand, "Biographical Memoir of the late F. A. Michaux"); Michaux's unpublished itinerary is preserved by the Am. Phil. Soc., at Philadelphia.

Eriodictyon glutinosum, Benth., as Illustrating Evolution.

(Plate II.)

As a teacher I have often been perplexed to answer the question of my pupils: why is it that to cells and tissues which so often shade into each other and which usually present such small differences you give distinct names? To the more advanced investigator, however, the problem comes in another shape, *i.e.* how is it that cells which start at first from a simple form of fundamental tissue eventually become so unlike? If the observer has allowed himself to philosophize over this question he most probably has learned to regard it as but another paragraph from the great chapter on evolution, and can hardly have escaped a wonder that cell variation is so little written or spoken of in this connection by botanists. Cell growth and development, whether rightly or wrongly, appear to have suffered a divorce from our ideas of specific evolution, yet the latter could not exist without the former. Simple parenchyma may be all sufficient for every form of thallus; but before a true caulome can rear its head into the air, there must be the differentiated, stiffening woody fibre; or before the hard-shelled nut could be produced, sclerenchyma must have appeared. Evidently then this differentiation has to do with success in the struggle for existence. But with all this, in the *great mass of plants* there appears to have come a settled average character in the different groups of cells and tissues; that is, differences marked enough exist, but we can read them through from the outside to the pith before ever a section has been made. On the other hand there are others which we have come to recognize as likely to show deviations from the regular order before we have examined them, though we cannot tell what directions those deviations will take. Some of these may serve to show evident connections between the different cell types in places where we hardly expected to find such links. I have recently been quite struck with this last class of facts in studying *Eriodictyon glutinosum* from the standpoint of practical pharmacy, though the facts themselves were entirely outside the objects I had in view, and have no bearing upon them. What I desire to call attention to here are simply gleanings which lay off, but alongside, the pharmaceutical trail.

A more striking instance of the connection between diverse forms of tissue can hardly be imagined than that furnished by the change from bast to sclerenchyma; the former being typically represented in the fibre which makes the napkins we use at the table, and the latter in the shell of the hickory nut which defies our youthful teeth. Yet figures 9 & 10 are taken from fibres in the Peruvian Bark which are so nearly on the boundary line that by some vegetable anatomists they are classed as bast and by others as sclerenchyma. Isolated in the pulp of pears are found the gritty grains of sclerenchyma, though from the same fundamental cells

come both the soft and the hard tissues. In the case of the pear there are manifest reasons for supposing the sclerenchyma to be a legacy from the period when pears as fruit were far less luscious than now. They are found in the pear stem as well as in the fruit. In the fully formed Sphagnum moss we recognize cells of two distinct characters; the one large, colorless, and with plain communication between the adjacent cells; the other small, having chlorophyll and destitute of communications; yet, if we may credit Huxley, both of these kinds are very similar in their early growth.

To return to the *Eriodictyon*, the character of the tissues have appeared to me to indicate how widely ultimate cell forms may depart from the original source out of which they all have sprung, and at the same time to show connecting links between even the most divergent members. In fact I am tempted to regard the whole plant as a forcible illustration of the doctrine of evolution.

Commence for example with figure 1, where we have the typical large, thin-walled, porous pith-cell, found in the very center of the stem. Outside of this, but still in the pith, are other smaller, thicker-walled cells, figure 2, which when observed on transverse section are roundish, but seen on longitudinal section are quite distinctly rectangular. More remote from the center of the pith, yet in it, we find the cells represented in figure 3; and this form is a direct transition to figure 4, which is taken from the medullary ray. Here then the transition, not by isolated cells, but by groups of cells, from one extreme of fundamental tissue to the other appears regular and gradual and ends in cells with well-marked sclerenchymatous character.

Suppose now we take the types of distinctly prosenchymatous character, which the bast zone of *Eriodictyon* furnishes. Figure 8 is the more usual form of bast found in other plants, though occasionally seen in *Eriodictyon*. Figure 7 will give us one of the commonest shapes of bast in *Eriodictyon*; and figure 6 represents a shorter kind often discovered in the bast and also throughout the woody part of the stem. Figure 5 may be called a representative sclerenchymatous cell, though it is found also in the bast zone. Here again we have four forms of cells which represent the transition from bast to sclerenchyma, and all in the same belt of the same plant.

The structure of the leaf of *Eriodictyon glutinosum* is even more suggestive. Figure 11 is a section through such a leaf. The first striking peculiarity is the thickness of the epidermal cells as shown by *a* and by *f*. This is particularly marked in *a*, the upper surface, where not only the thick walls of the cells but the pores in them remind one of figure 3, taken from the outer pith. This as being the more exposed surface would naturally show the denser tissue. The secreting gland, *b*, has no particular import in the present connection. Three rows (ordinarily) of palisade cells come

next underneath the upper epidermis and appear to be special provision against excessive evaporation and are in entire keeping with the thick epidermis. They are thin-walled and contain abundance of chlorophyll, though probably less than the proper parenchymatous cells next below them. These last-named parenchymatous cells are, as might be expected, loose in their aggregation and show numerous open spaces which are in apparent relation to the admission and escape of atmosphere and the contained gases of the plant. The under surface of the leaf is raised into ridges or prominences between which in the cavities so formed the stomata (*h*) are placed under protection of numerous inflected and variously curled hairs (*g*). This mode of placing and protecting the stomata is by no means uncommon, being found also in the *Oleander*, in *Banksia*, and in *Ceanothus prostratus*, to say nothing of many other plants. Sometimes, at least, it is known to be associated with dry habitats; often enough, at least, to suggest the inquiry as to whether it may not be to prevent stomata which occupy such cavities from becoming choked with dust or other foreign bodies. This raises the question as to the meaning, from the standpoint of evolution, of such elevations and depressions on the under surface of the leaf. So far as I am aware they are never seen except in hard-leaved plants, which leaves are also often further protected by a thick coating of hair. Is all this a mere trace remaining of what was once a more common structure, adapted to more variable or more inclement (hot or cold) climate, before the elevations were smoothed away and the hairs were rendered unnecessary by the more genial conditions of present snrroundings? This is simple conjecture on my part, but I cannot avoid thinking that it is not far from the truth.—Dr. J. T. Rothrock.

Explanation of Plate II.—*Eriodictyon glutinosum*, Benth.

Figure 1. Typical pith cell X 240, from central part of pith.
Figure 2. Typical pith cell X 240, from outer part of pith.
Figure 3. Less common form of pith cell X 240, from outer part of pith.
Figure 4. Isolated cell X 240, from medullary ray.
Figure 5. Sclerenchym cell X 240, found in the bast zone.
Figure 6. Longer sclerenchym cell X 240, found in bast zone, and also along with woody fibre in interior of stem, where it would be regarded as a thickened form of wood parenchyma.
Figure 7. Typical cell X 240, from bast zone.
Figure 8. More common form of bast cell as found in other plants. *Cinchona flava*, though also occasionally in *Eriodictyon*.
Figure 9. Bast (or sclerenchym ?) cell X 120, longitudinal view.
Figure 10. Same X 240, transverse section.

Eriodictyon glutinosum, Benth.

Figure 11. Leaf section; *a*, epidermis of upper surface showing thick walls and pits; *b*, secreting gland backed by striated cuticle; *c*, palisade cells; *d*, parenchym cells; *f*, epidermis of lower surface; *g*, long hairs which guard the stomata (*h*) seated in a cavity on the under surface of the leaf.

Notes on Indiana Plants.

The following additional plants, or localities for plants already recorded for Indiana, may be given, with notes on the more interesting cases.

At Otis, LaPorte, Co., *Geum rivale*, L. and *Viburnum Opulus*, L.

At Pine Station, Lake Co., *Gentiana detonsa*, Fries. Good typical forms, readily distinguished from all ordinary forms of *G. crinita*. From all my experience with the two species growing in this locality, it is hard to tell to which of the two certain individuals that may be found should be assigned. Those at Pine Station are the first that really satisfied me as genuine specimens of the *G. detonsa* of the books, though often finding narrow-leaved plants with petals that could scarcely be called fringed.

At Whiting, Lake Co., *Utricularia resupinata*, Greene. Margins of sandy sloughs, with *Eleocharis dispar*, nobis. The geographical distribution of this plant, as far as I find in published notices, is as follows: Gray's Manual, "Sandy margins of ponds E. Maine to Rhode Island." In *Bulletin of the Torrey Botanical Club*, Suffolk Co., Long Island, Herkimer and Lewis Counties in the northern part of New York, and Erie, Penn. In Wheeler and Smith's Catalogue of Michigan Plants, Woodard Lake, Ionia Co. As it is now found at the southern extremity of Lake Michigan, it is possible that it has gone further westward.

In Cedar Lake, Lake Co., (near Crown Point) *Potamogeton pusillus*, L., and *P. pectinatus*, L. By its margin or in pools or in sluggish streams near by, *P. pauciflorus*, Pursh. Leaves 5-nerved, 3½ inches long; stipules ½ to ¾ inch long. A large form, approaching *P. Niagarensis*, Robbins.

By the shores of Cedar Lake, *Eleocharis palustris*, R. Br., var. *calva*, Gray. Without bristles, but with a prominent pyramidal tubercle, as in the var. *glaucescens*, Gray. The description of the var. *calva* is, "short tubercle;" specimens sent by Rev. Thomas Morong, collected in Vermont, also have the turbercle quite long. In 1881 I gathered plants of this variety along the gravelly banks of St. Mary's River, Sault. Ste. Marie, Ontario, that had the flattened tubercle. In some spikes of the Vermont specimens rudimentary bristles were found. Perhaps the description of the variety should be limited to the absence of bristles.

Polygonum articulatum, L. This grows abundantly in the dry sandy grounds around the head of Lake Michigan, but almost always with the flowers white, or the faintest tinge of "rose." Such had been my experience since first finding it in 1877, until the past season, when plenty of them showed the rose-colored flowers, though the greater part were still the white-flowered kind. I have examined it every year since first seeing it, and must conclude that the white flowers prevail. The variations are not easily explained.

The rose-colored plants almost always grew where they were exposed to the direct rays of the sun, but there were numerous white ones, as on previous years, not in the shade of trees.

Viola lanceolata, L. At Miller's, Lake Co., specimens occur with the serratures of the leaves tipped with reddish glands.

Lechea thymifolia, Michx. (*L. Novæ-Cæsareæ*, C. F. Austin, *fide* W. H. Leggett) This was seen in full bloom Sept. 16, near Tolleston, Ind., the locality where I first found it. It is not easy to find a *Lechea* with the flowers open. The late Mr. Leggett, who is known to have given special attention to them, mentions but one case, that of *L. maritima*, Leggett, (*L. thymifolia*, Gray's Manual) seen in bloom at Cotuit, near Cape Cod (*Torr. Bull.* Oct. 1881). The flowers were abundant on the branches, and made the plants look so different as to be quite pretty objects. The corolla, fully expanded and somewhat wheel-shaped, is about 2 lines in diameter. Petals 3, elliptical, varying from dark red to purple, paler at the base. Stigmas 3, white, plumose. Rafinesque states that the anthesis lasts but a few hours, towards noon. These were found just before midday, and soon closed after placing them in the collecting case.—E. J. HILL, *Englewood, Ill.*

Ballast Plants in Boston and Vicinity.

The preparation of the following list of plants, chiefly ballast species, was suggested to the writer several years ago by the publication of similar lists by others. Some of these may be found in the GAZETTE for November, 1876, August, 1877, May, 1878; the *Torrey Bulletin* for September, 1878, and November, 1879, and the *Proceedings of the Phila. Academy of Sciences* for 1867, 1877 and 1880.

In all of the lists referred to, the general character of the plants is about the same; that is they are for the most part mere weeds (already widely diffused) from the same localities and representing the same natural orders. So that those who find them hereafter may save themselves some trouble by consulting the lists mentioned, before trying to identify the plants.

In the large seaports, where these plants are found, there are generally botanical works in the Public Libraries in which will be found most ballast plants plainly enough described.

They seem to come about equally from the Southern States, S. Europe and Great Britain; with a few from S. America, the Pacific coast, and the West Indies, and an occasional waif from more remote places. So that many may be found in Chapman's Flora, any English handbook, and a German or French Flora.

The following list represents perhaps two-thirds of the species I found between the years 1877 and 1882 (inclusive), and the plants, excepting those marked with an asterisk (which were found *near* Boston), were found within the city limits, on ballast or rubbish

I have seen no record yet of the italicised species having been found in the Northeastern States, though some have probably been found there before.

I am much indebted to Prof. Gray, Prof. Goodale, Prof. Watson, Mr. Isaac C. Martindale, and Mr. F. L. Scribner for determining the species for me. Mr. Scribner identified all or nearly all of the *Gramineæ*.

The affixed letter *e* indicates that the species is established, generally in a small way; *o* means occasionally; *f*, frequently; *s*, found only once.

Ranunculus muricatus, L. s
*Alyssum incanum, L. s
Diplotaxis muralis, DC. e
" tenuifolia, DC. e
Eruca sativa, L. r
Erysimum cheiranthoides, L. o
" repandum, L. s
Rapistrum rugosum, All. s
Senebiera coronopus. DC. o
" didyma, Pers. o
Sisymbrium Sophia, L. s
Thlaspi arvense, L. o
Lychnis Githago, Lam. o
Vaccaria vulgaris, Host. r
Reseda alba, L. s
Malva borealis, Wallm. o
Erodium cicutarium, Sm. f
" moschatum, Sm. o
Geranium dissectum, L. s
Sida carpinifolia, L., var. *brevicuspidata*, s
Arachis hypogæa, Willd. o
Coronilla scorpioides, Koch, s
Dalea alopecuroides, Willd. s
Lathyrus aphaca, L. r
Lotus corniculatus, L. e
Medicago denticulata, Willd. f
" *laciniata*, All. s
" *lappacea*, s
" maculata, Sibth. r
" sativa, L. o
Melilotus parviflora, Desf. r
" *sulcata*, Desf. r
Psoralea sp.
Trifolium hybridum, L. e
" resupinatum, L. s
Trigonella corniculata, L. s
" *laciniata*, L. s
Hemizonia pungens, T. & G. s
Hymenatherum tenuilobum DC. s
Hypochæris radicata, L. r
Matricaria inodora, L. e
Pulicaria dysenterica, Cass. r
Senecio viscosus, L. e
Xanthium catharticum, HBK? s
" spinosum, L. o
Campanula Erinus, L. s
Anagallis arvensis, L. r
Linaria cymbalaria. Mill. r
Veronica agrestis, L. r
Verbena bracteosa, Mx. s
" officinalis, L. s
Calamintha Clinopodium, Benth.
Origanum Majorana, L. s
Satureja hortensis, L. o
Thymus Serpyllum, L. r
Asperugo procumbens, L. r
Echinospermum Lappula, Lehm. f
Hyoscyamus niger, L. r
Nicotiana longiflora, Cav. s
Physalis Alkekengi, L. o
" angulata, L. s
" lanceolata, Mx. s
Solanum rostratum, Dunal. r
Atriplex hortensis, L. r
" rosea, L. o
Chenopodium multifidum, L. s
Amarantus paniculatus, Moq
" spinosus, L. o
Frœlichia Floridana, Moq. s
Emex spinosa, Campd. s
Polygonum lapathifolium, var. incanum, f
Croton sp. s
Euphorbia Helioscopia, L. r

Vicia Faba, L. s
" hirsuta, Koch, o
" tetrasperma, Loisel. o
Œnothera sinuata, L. o
Mentzelia sp. s
Coriandrum sativum. L. o
Cuninum cyminum, L. r
Fœniculum vulgare, Gærtn. o
Pimpinella Anisum, L. r
Scandix Pecten, L. r
Galium aparine, L. r
* " Mollugo, L. r
Crupina vulgaris, Pers? r
Scabiosa Columbaria, L. e
Acanthospermum xanthioides, DC. s
Ambrosia trifida, L. r
Anthemis arvensis, L. f
" nobilis, L. o
" tinctoria, L. o
Artemisia annua, L. s
" biennis, Willd. e
Bidens bipinnata, L. o
Carduus acanthoides, L. s
Carthamus tinctorius, L. s
Centaurea Americana, Nutt. s
" calcitrapa, L. r
" cyanus, L. o
**Cotula coronopifolia*, L. e
Eclipta alba, r
Gaillardia sp.
Galinsoga parviflora, e
Helenium tenuifolium, Nutt. s
Mercurialis annua, L. r
Parietaria diffusa, Koch, s
Urtica urens, L. s
Agrostis australis, L. s
" Spica-venti, L. r
Alopecurus agrestis, L. r
Bouteloua Humboldtiana, Griseb. s
Briza maxima, L. s
Bromus brizæformis, s
" *maximus*, Desf, s
" mollis, L. r
" *patulus*, Koch, s
" sterilis, L. s
" tectorum, L. f
Cenchrus tribuloides
Chloris alba, Presl. s
Cynodon Dactylon, Pers. r
Eragrostis poæoides, Beauv., var. megastachya, e
" Purshii, Schrad. e
Festuca Myurus, L. r
" rigida, Kunth, s
Hordeum maritimum, With. s
" murinum, L. r
" pratense, Huds. s
Lappago racemosa, Willd. s
Panicum miliaceum, L. f
Phleum tenue, Schrad. s
Polypogon Monspeliense, Desf. r
Sorghum Halapense, Pers. s
" saccharatum, L. s

—CHAS. E. PERKINS, *Somerville, Mass.*

GENERAL NOTES.

Lindley's Introduction to Botany.—It must have been Lindley's *Introduction to the Natural System of Botany*, which Dr. Torrey admired in 1831. This was issued in England in 1830. Lindley's *Introduction to Botany* was not issued till 1832.—T. M.

Bentham and Hooker's Genera Plantarum.—Part 2 of Vol. III, completing the work, is nearly ready for publication. Those who wish to obtain this part, like the preceding, at trade price, through us, will please to send a notification to that effect to The Curator of the Harvard University Herbarium, Cambridge, Mass., without delay.— A. GRAY.

The trade price in London for the new part is £1.4.0.

Gonolobus Shortii, *G. obliquus*, var. *Shortii*, differs from *G. obliquus* in corolla-lobes more broadly ligulate and obtuse, dark-purple; stamineal crown with about 10-dentate margin, the longer teeth thinnish and narrower, from emarginate to 2-parted, the alternate broader ones thickish and more or less fleshy-appendaged within.—I wish to call attention to this on the part of botanists who may reside in, or may visit the district it inhabits. Dr. Short collected it near Lexington, Kentucky, and noted that the blossoms had the scent of those of *Calycanthus*, as also they have a similar color. The specimen I had to examine was greatly injured; else I might at the first have detected the characters which clearly distinguish it from *G. obliquus*, and associate it rather with *G. Carolinensis*. Dr. Chapman has collected it near Rome, Georgia (where *G. obliquus* also grows), and has furnished good flowering specimens. The fruit is still a desideratum.—A. GRAY.

The Stigma of Catalpa.—At p. 171, this volume, it is noted that at Lansing, Mich., the flattened lobes of the stigma in *Catalpa speciosa* "close in a few seconds after they are touched, close before a bee backs out of the flower." If this observation be correctly made, it will afford another character by which this species may be distinguished from *C. bignonioides*. I have timed this by the watch and never found one to be closed under 45 seconds, and half a dozen bees could enter and depart in that time. Aside from this it will be of great interest if this rapid closing in this plant should be confirmed. There are many species belonging to *Bignoniaceæ* and *Scrophulariaceæ* which have these irritable stigmatic lobes. I have timed many of them. The most rapid in my experience was the common garden *Mimulus*, but this took 15 seconds. A bee is seldom more than from 3 to 5 seconds in any of these flowers.
—T. M.

More about Rafinesque. As an appendix to the interesting sketch of Rafinesque, in the January number of the GAZETTE, the following excerpt from the diary of Audubon, giving an account of a visit from this "odd fish," will be relished by those who have not seen it before. Audubon at the time was living in Kentucky. He says: "I presented my learned guest to my family, and was ordering a servant to go to the boat for my friend's luggage, when he told me he had none but what he had brought on his back. He then loosened the pack of weeds which had first drawn my attention. The naturalist pulled off his shoes, and while engaged in drawing his stockings down to hide the holes in his heels, he explained that his apparel had suffered from his journey. His attire struck me as exceedingly remarkable. A long loose coat of yellow nankeen, much the worse for the many rubs it had got in its time, and stained all over with the juice of plants, hung loosely about him like a sack. A waistcoat of the same with enormous pockets, and buttoned up to the chin, reached below over a pair of tight pantaloons, the lower part of which were buttoned down to the ankles. His beard was as long as I have known my own to be during some of my peregrinations, and his lank black hair hung loosely over his shoulders. His forehead was so broad and prominent that any tyro in phrenology would instantly have

pronounced it the residence of a mind of strong powers. He requested to see my drawings, anxious to see the plants I had introduced besides the birds I had drawn. Finding a strange plant among my drawings he denied its authenticity; but on my assuring him that it grew in the neighborhood, he insisted on going off instanter to see it. When I pointed it out the naturalist lost all command over his feelings and behaved like a maniac in expressing his delight. He plucked the plants one after another, danced, hugged me in his arms, and exultingly told me he had got, not merely a new species, but a new genus. After a day's pursuit of natural history studies, the stranger was accommodated with a bedroom. We had all retired to rest; every person I imagined was in deep slumber save myself, when of a sudden I heard a great uproar in the naturalist's room. I got up and reached the place in a few moments and opened the door; when, to my astonishment, I saw my guest running naked, holding the handle of my favorite violin, the body of which he had battered against the walls in attempting to kill the bats which had entered by the open window, probably attracted by the insects flying around his candle. I stood amazed, but he continued running round and round, until he was fairly exhausted, when he begged me to procure one of the animals for him, as he felt convinced that they belonged to a "new species". Although I was convinced to the contrary, I took up the bow of my demolished Cremona, and administering a smart tap to each of the bats as it came up, soon got specimens enough. The war ended, I again bade him good night, but could not help observing the state of the room. It was strewed with plants, which had been previously arranged with care. He saw my regret for the havoc that had been created, but added that he would soon put his plants to right—after he had secured his new bats."—M. S. B.

EDITORIAL NOTES.

PROF. E. J. HILL, of Englewood, Ill., gave a lecture on the "Means of Plant Dispersion" before the Chicago Microscopical Society at their January meeting.

MR. WILLIAM R. DUDLEY, in the *Torrey Bulletin* for January, describes, with the help of a plate, some interesting cases of adnation occurring between the berries and leaves of *Mitchella repens.*

L. JUST has found that green plants cannot assimilate carbonic oxide but that it does them no harm except when its proportion in the atmosphere exceeds 10 per cent. It then prevents the formation of chlorophyll and hinders assimilation and growth.

DR. MAXWELL T. MASTERS has described in the *Journal of Botany* for February some new *Passifloreæ*, all from South America. A new genus, *Mitostemma*, is represented by two species, one from South Brazil and the other from British Guiana. The genus *Passiflora* receives five new species.

MR. JOSEPH F. JAMES publishes a paper on "Pitcher Plants" in the March *Naturalist*, in which he advances the idea that in *S. purpurea*

the pollen or some secretion of the flower is intoxicating and so the insects drop over the edge of the broad stigma into the open leaf cups below. The theory is supported by analogy and the position of the parts rather than by any direct observation.

M. J. VESQUE has succeeded in devising a method by which the movements of water in plants can be directly observed. In applying this method in testing the theories that are held with regard to the exact route of the ascending water, it appears that the true view is a "golden mean." Under certain conditions the water is transferred by means of the cavities themselves, but they may also serve as reservoirs.

R. ZEILLER has found the stomata on a fossil Cretaceous conifer quite well preserved. Curiously, the cells guarding each stoma are four and occasionally five in number arranged radiately, thus leaving instead of a simple slit a star shaped opening with four or five rays. The stomata are arranged in rows and the orifice is situated at the bottom of a slight depression which is surrounded as in living allies by a slightly projecting edge of cuticle.

MR. FRANCIS WOLLE, of Bethlehem, Penn., in a recent letter, refers to the article in the January number of the *American Naturalist* on the method to be used in interpreting the microscopic portion of the descriptions of Schweinitz, and confirms the conclusions there given. He was in youth acquainted with Schweinitz, and sent him specimens. His microscope was of German make, and in its day was considered a very good one, but would not now be serviceable.

MR. GRANT ALLEN'S theory that petals are transformed stamens rather than leaves, and that hence the earliest and simplest existing petals would be yellow, cannot carry conviction without answering some very serious objections. How the line can be drawn between petals and sepals it is hard to say, and from colored sepals to colored bracts is not a great distance and the relation between leaf and petal seems still a very close one. That yellow is the prevailing color in the *Compositæ* and very common in *Leguminosae* and *Orchidaceæ*, which are very far from being the "simplest types," is also hard to explain if we accept the statement that the earliest and simplest existing petals would be yellow, and that the colors would change with increased complexity.

DR. J. G. BAKER is publishing in the *Journal of Botany* a Synopsis of the genus *Selaginella*. It seems that, ferns excluded, half the known vascular Cryptogams belong to this genus. Its headquarters are in Tropical America, only two species extending into Europe, and those of the Cape, Temperate Australia, etc., being by no means numerous. The leaf-organs furnish characters for an easy division into four subgenera, depending upon "their arrangement upon either a distichous or multifarious plan and their uniformity in shape and character or dimorphism." The names given to these subgenera are *Selaginella* proper, *Stachygynandrum*, *Homostachys*, and *Heterostachys*, and under them are grouped 312 species.

PROF. J.G. LEMMON claims to have discovered that the potato is indigenous to Arizona. In the Huachuca Mountains last season, in July, he discovered a species of *Solanum* in full bloom, with both the white and

blue flowers. By the 1st of September undoubted potatoes had formed, about an inch and a half long by half as wide and a third as thick. Since then tubers have been found in the same region perfectly white and as large as hen's eggs. If this plant really is the original of all our cultivated varieties much may be hoped from its cultivation, in the way of regenerating the old varieties which have become weak, and we hear that Prof. Meehan predicts great results from this discovery. It is needless to say that Prof. Lemmon found the Colorado beetle quietly munching the leaves of this indigenous potato.

DR. GRAY reviewing in *Science* DeCandolle's work, *Origine des plantes cultivees*, claims that our common bean, *Phaseolus vulgaris*, is a native of America. This is one of the three cultivated plants out of a total of 247, the other two being the rather unimportant species of *Curcubita, C. moschata* and *C. ficifolia*, which DeCandolle is unable to trace to its original country. Dr. Gray maintains that it is American, as he has previously done with Indian corn and pumpkins. Fruits and seeds of it were found in the tombs of the ancient Peruvians at Ancon, along with other vegetable products belonging solely to this continent, and with the other two vegetables named, has been cultivated from aboriginal times from Mexico to Canada. It is probable, however, that neither beans nor pumpkins were originally indigenous north of Mexico, or possibly north of the isthmus of Panama.

DR. GRAY, in a private letter, gives us some interesting information concerning Dr. Torrey which so well illustrates his generous disposition that we quote it as follows: "Sir Wm. Hooker confided to Dr. Torrey, at the time when Dr. Torrey visited him at Glasgow, the Carices of those northern collections to be worked up by him. But, while the bundles were still unopened, Dr. Chester Dewey made him a visit at New York. Dr. Dewey was the author of a rival monograph of American Carices, which was published in numerous articles in *Silliman's Journal*, partly contemporaneously with the monograph of Schweinitz and Torrey, and partly later. An inspection of those rich northern collections revived Dr. Dewey's interest in the subject; observing which Dr. Torrey generously offered the collection to his rival for study; and the latter continued his monograph with these materials. Later, when Dr. Torrey had monographed the other N. American *Cyperaceæ*, he appended to it a revised arrangement of *Carex*, and added some new species.

THE FIRST THREE NUMBERS of the new American Journal, *Science* have come to hand. It is a 4to of about 28 pages, and reminds one of the English journal *Nature*, and like that appears weekly. The term "science" has been liberally construed, but in the multiplicity of departments botany receives due attention. The first number devotes five columns to a review by Dr. Gray of DeCandolle's new work on the origin of cultivated plants. In the weekly summary of the progress of science, botany receives two columns in each number. The notes have

so far been prepared by Dr. G. L. Goodale and Mr. Sereno Watson, of Cambridge, Mass., Prof. Wm. Trelease, of Madison, Wis., and Mr. Leo Lesquereux, of Columbus, Ohio. They embrace 32 seperate items gleaned from no less than 18 journals, of which two-thirds are foreign, and cover a wide range of topics. The journal is as invaluable to the botanist as to the worker in any other department of science. It must, however, be regretted that the latest information regarding the minute structure of plants and the vast and interesting field of the lower orders does not receive more attention.

CURRENT LITERATURE.

On the Structures which favor Cross-Fertilization in several Plants (with three plates). By William Trelease. From the Proceedings of the Boston Society of Natural History, Vol. XXI, March 15, 1882. The author of this valuable contribution to the literature of cross-fertilization has long been engaged in a careful investigation of the subject and has repeatedly published valuable results. The present pamphlet is a collection of observations heretofore unpublished, and contains notes upon certain of the *Lemnaceæ*, *Proteaceæ*, *Rutaceæ*, *Ericaceæ*, *Labiatæ* and *Acanthaceæ*, for the most part exotics. *Lemna minor*, however, is a native, and this species, one of the very smallest of phanerogams, seems to be well adapted for crossing though if that is a failure there is a chance for self-fertilization. It is protogynous and the two anthers mature successively some days after the stigma. Cross-fertilization is effected by the aid of currents of water, making it a hydrophilous plant. The *Proteaceæ* are found to be apparently adapted to self-fertilization, but are so formed as to favor crossing, sometimes even to the exclusion of the former, the pollinators including bees, butterflies, and three distinct groups of birds, Kerner's curious conjecture that in *Dryandra* the transfer of the pollen is effected by the Kangaroos being mentioned simply as a curiosity. But our space forbids any fuller mention of the many interesting details to be met upon every page of this pamphlet. Strange as many of the exotic forms are our interest centers about the little *Lemna* whose effort after crossing is a very strong argument in favor of the idea that continued propagation by self-fertilization is not best for a species.

Supplement to Chapman's Botany.—Chapman's Flora of the Southern States has so long been out of print, and discoveries and changes in nomenclature have been so numerous that we had hoped for a revision rather than a reprint with a supplement. It would, however, probably be too much to ask of our oldest American botanist, and we take this supplement as the best substitute, being really a condensed record of discoveries, most of which have already been noted in our various periodicals and published proceedings of our learned societies. Most of the additions come from Florida, whose flora, so deeply tinged with West Indian forms, has been most zealously examined for the past few years, and the names of Curtiss, Garber, Miss Reynolds, and others, are closely associated with that of Dr. Chapman himself. No fewer than 200 species from Florida have thus been added to our catalogue of the Southern Flora, and this means only species which have not yet been found to extend beyond the limits of the State. The region most favored in new forms, after Florida, is that nest of mountains which is found

where Tennessee, North Carolina, and Georgia interlock and runs northward through Eastern Tennessee and Western N. Carolina. Here are discovered many forms from the north, having found in the elevations of the mountains compensation for a more southern latitude, no fewer than 65 such species being noted in this supplement. Speaking of the northerners we remark the occurrence of *Sedum Rhodiola* in the Mts. of N. C., which was found years ago clinging to a cool cliff near Easton, Penn., and taken as an example of a stranded glacial visitor. *Asplenium ebenoides*, too, has been found in shady ravines in central Alabama, and *Erythronium albidum* upon the very summit of Roan Mountain. The Mississippi river has also kept up a movement of species southward and its influence is very noticeable in glancing over this supplement. Naturally the West has not contributed so many forms as either the South or North, for the barriers in that direction are greater. We note, however, about 25 species which may be considered to have come from the West. These figures of course only apply to the supplement, and in a study of the original Manual it will be seen that this composite flora is tinged more from the north than from the south on account of the greater ease of communication in that direction; while the western forms still remain in the background. Some 15 species are published here for the first time, 10 of them bearing Dr. Chapman's name as author, and 12 of them from Florida. They are an *Alsine*, *Polygala*, *Petalostemon*, *Ludwigia*, *Pinguicula*, two *Euphorbias*, *Croton*, *Tillandsia*, *Xyris*, *Cyperus*, *Rhynchospora*, two *Paspalums*, and an *Andropogon*. Two orders for the first time find place in our Flora, namely, *Casuarineæ* and *Piperaceæ*, containing together 3 species, all from Florida.

ARTICLES IN JOURNALS.

ALLEN, GRANT.—The Pedigree of Wheat (from Macmillan's Magazine), *Pop. Sci. Mo.* XXII, p. 662.

BAKER, J. G.—A Synopsis of the Genus Selaginella (continued), *Jour. Bot.* XXI, p. 42.

BRITTEN, JAMES.—Editorial Notice of Alph. DeCandolle's "Origine des Plants cultivees," *Jour. Bot.* XXI, p. 56.

BURRILL, T. J.—New Species (5) of Micrococcus (Bacteria), *Am. Nat.* XVII, p. 319.

DAVENPORT, GEORGE E.—Fern Notes, VI, *Torr. Bull.* X, p. 4.

DUDLEY, WILLIAM R.—Leafy Berries in Mitchella repens (with plate), *Torr. Bull*, X, p. 1.

ELLIS, J. B.—New Species (35) of N. Am. Fungi, *Am. Nat.* XVII, pp. 192, 316.

GEYLER.—Notice of J. Felix's "Studies upon Fossil Woods," *Bot. Zeit.* Feb. 2.

GOODALE, G. L.—Notice of Vesque's "Direct observation of the movement of Water in Plants," *Am. Jour. Sci.* 3. 25, p. 237.

GRAY, ASA.—Review of Grant Allen's "The Colors of Flowers," *Am. Jour. Sci.* 3. 25, p. 236.

HITCHCOCK, ROMYN.—Unicellular Algæ, *Am. Mo. Mic. Jour.* IV, p. 21.

JAMES, JOSEPH F.—Pitcher Plants, *Am. Nat.* XVII, p. 283.

KUTSCHER, EMIL.—Upon the function of tannic acid in metastasis of the plant, *Flora*, Feb. 1.

MASTERS, MAXWELL T.—New Passifloreæ (one genus and eight species, all from S. Am.), *Jour. Bot.* XXI, p. 33.

MUELLER, C. J.—On the Discrimination of Different Species of Wood by Microscopical Examination, *Sci. Gossip*, No. 218, p. 39.

REINKE, J.—Autoxydation in the living plant-cell, *Bot. Zeit.* Feb. 2, concluded Feb. 9.

STODDER, CHARLES.—Notes on Diatomaceæ from Tampa Bay, Fla. *Am. Mo. Mic. Jour.* IV, p. 30.

TRELEASE, WILLIAM.—On the Structures which favor Cross-Fertilization in Several Plants, *Proc. Bost. Soc. Nat. Hist.* XXI, p. 410.

VORCE, C. M.—The Detection of Adulteration in Food (Mustard, with plate), *Am. Mo. Mic. Jour.* IV, p. 24.

WAGER, JOHN.—The Danish Forest, II, *Sci. Gossip*, No 218, p. 29.

WIESNER, J.—Notice of the Memoir of Dr. Julius Wortman upon Nutation, *Bot. Zeit.* Feb. 2.

WINTER, GEO.—New N. Am. Fungi (3) *Torr. Bull.* X, p. 7

WRIGHT, E. P.—Review of Sach's Text-Book of Botany (Vine's Translation, 2d edition), *Nature*, XXVII, p. 263

ARTHUR ON CAMPTOSORUS.

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Some Nor.h American Botanists.

IV. John Eatton LeConte.

Fifty years ago the writer of this notice was botanizing in the Pine barrens of New Jersey. While his quarters were in the little wayside inn at Quaker Bridge—then a kind of Mecca to which all good botanists were bound to make a pilgrimage—the entire loneliness of his sojourn was one day brightened by the arrival of a middle-aged man, of very pleasant demeanor, who came in a private vehicle from Philadelphia, and who, although then searching for certain insects, was at once seen to be an accomplished botanist. The writer had just found, at Atsion, a little below Quaker Bridge, the plant which we now call *Breweria Pickeringii*, and it was, with one possible exception, the first time it had been found in the Northern States and before it had been made known from North Carolina. The natural relationships of plants were not well understood in those days by youthful botanists; and the discoverer thought he had found a new Solanaceous plant; and was rather surprised when the gentleman told him that it was a *Convolvulus*. The gentleman was Major LeConte. During several succeeding years the writer, along with his master, Dr. Torrey, used to call in now and then and take tea with Major LeConte, at his house in New York. Mr. LeConte was a widower, with one son, an only child, then a lad, whose actual knowledge of natural history, and whose intense avidity for more, exceedingly interested and amused his older companions, and foreshadowed the entomologist who was to give new *eclat* to the name he inherited.

The following sketch, supplied to my hand, succinctly indicates the principal points in the genealogy and uneventful life of the subject of this notice.

John Eatton LeConte was born near Shrewsbury, New Jersey, February 22, 1784, and died in Philadelphia, November 21, 1860. His residence was partly in New York, where he was educated at Columbia College, partly in Georgia, where his father possessed a large tract of property in Liberty County. His family is of Huguenot descent, his ancestor, William, having left Normandy on the revocation of the Edict of Nantes to join the army of William, afterwards King of England. Thence coming to America he settled in New York, about the year 1692. His son, Peter Le-

Conte, was a highly esteemed physician in the lower part of New Jersey, and married Valeria, a daughter of John Eatton of Shrewsbury, among whose numerous descendants may be counted some of our most eminent citizens. From an early age his two sons, John Le-Conte and his brother Louis, showed a great love for Natural History and the observation of animals and plants. As young men they spent several years in Georgia, where they cultivated their father's plantation and occupied their leisure in the pursuit of science. Here it was that they established a botanical garden, mentioned frequently by the earlier travelers in the United States. This love of Nature and the observation of its phenomena has pervaded almost all the members of the LeConte family. About the year 1817, John LeConte entered the army of the United States as Captain of Topographical Engineers, and after serving ten years received the customary brevet as Major; but finding his health shattered by exposure during an exploration of the St. Johns River in Florida, undertaken in the line of his duty, he made a journey to Paris in 1827, where he formed the acquaintance of many of the most eminent men of science there, and with whom he subsequently kept up a correspondence. In 1832 or 1833 he resigned his commission in the army, and lived the retired life of an invalid in New York, until 1852, when he moved to Philadelphia.

His contributions to botanical and zoological science were published mostly in the Annals of the Lyceum of Natural History of New York, and in the Proceedings of the Academy of Natural Sciences of Philadelphia from 1852 to 1860. His extensive and valuable herbarium, which had been carefully reviewed by the older botanists of the country, was presented to the Academy of Natural Sciences of Philadelphia in 1852, and was followed shortly after his death by a large collection of fresh water mollusca of the United States, containing many original specimens of species first observed by him. He was a most untiring student and left much manuscript, the usefulness of which has been superseded by subsequent research, and likewise many thousand water-color drawings of insects of various orders, which his son has had mounted in albums suitable for inspection.

No separate botanical work bears his name as author, nor any in zoology that we know of, except one on American Lepidoptera, published in connection with M. Boisduval. But the Royal Society's Catalogue of Scientific papers records the title and place and date of publication of thirty-five of them, eleven of which are botanical. Several of these are monographs. The earliest, on the U. S. species of *Paspalum*, was published in the year 1820; three others, namely, those on *Utricularia*, *Gratiola*, and *Ruellia*, all in 1824; those on *Tillandsia* and on *Viola* in 1826; that on *Pancratium* in 1828. He was a keen but leisurely observer and investigator, and still more leisurely writer. He was a man of very refined

and winning manners, of scholarly habits and wide reading, of an inquiring and original turn of mind, the fruitfulness of which was subdued by chronic invalidism. When he went to Paris he took with him his herbarium, which for that time was unusually rich in plants of Lower Georgia and Florida; and we remember his remark that his botanical acquaintances there made very free use of his permission to help themselves to the duplicates. There is reason to think, accordingly, that the remains of it which went to the Philadelphia Academy of Natural Sciences will not throw all the light which might be expected upon the species of plants which were described in his published papers.

His old friends, Torrey and Wm. Cooper, named in his honor the genus which, as it proved, Rafinesque had some years earlier named *Peltandra*. And the opportunity was soon lost of commemorating his name in a plant of his own country: for Achille Richard in Paris, in 1829, bestowed the name of *Lecontia* upon a genus of Madagascar *Rubiaceæ*, now of five species. Although the name of John E. LeConte is best known to fame, it ought to be recorded that his brother, Louis, was also a keen botanist and excellent observer. The writer of this notice never knew him personally, for all but the earlier years of his life were passed upon the family plantation in Georgia. His name is mentioned in the perface as one of the contributors to Torrey & Gray's Flora of North America; and he deserved well of science in another respect, for he was the father of the two LeContes—President and Professor—of the University of California.—A. GRAY.

A New Walking-Fern.

(PLATE III.)

Although the variation of the common walking-fern (*Camptosorus rhizophyllus*) is very considerable, all the forms show a more or less auricled base. The auricles of the small forms are often so broad as to be nearly confluent with the stipe. On the other hand, I am informed by Mr. Davenport that in his herbarium are specimens with the base of the blade simply obtuse, the auricles having become quite obsolescent. But the latter is a rare occurrence, and appears to be the extreme of variation in the direction of a narrowed base. The interesting form of which an illustration is given herewith, has the striking peculiarity of an acute base without proper auricles. It was found and communicated by Mr. J. G. Haupt in Muscatine County, Iowa. It covered a few square yards, and was seen in but the one spot. The common form grew a few rods away, and by its luxuriance and large size gave prominence to the new kind.

The character of the base, together with some others, shows a considerable divergence from the typical form, and seems to indi-

cate an established variety, or at least a well marked form. Whether a good variety or not can better be told after the study of a larger number of specimens and from other localities. There is at least sufficient peculiarity to merit a careful description, and for the present, the rank of variety may be assumed.

CAMPTOSORUS RHIZOPHYLLUS, Link, var. INTERMEDIUS (n. v.). Rootstalk short, ascending, clothed with a few dark-brown scales; stipe green, with a brown base, containing a single rounded-triangular fibro-vascular bundle without accompanying sclerenchyma; fronds dimorphous, subcoriaceous, thinnish; sterile frond 2 to 4 inches long, triangular-acuminate, sometimes prolonged and rooting; base broadly wedge-shape; apex blunt; fertile frond 4 to 12 inches long, narrowly lanceolate, broadest close to the base, greatly attenuated and prolonged, rooting at the apex; base acute, broadly wedge-shape, never cordate; veins strongly ascending, anastomosing and forming about two series of areolæ; sori few, oblong, sometimes in pairs, or confluent at the upper part of the areolæ; indusium smooth, delicate, with a sinuous margin; spores ovoid, with broad anastomosing wings of irregular width. Sterile blade $\frac{1}{4}$ to $\frac{1}{2}$ inch broad near the base, fertile blade $\frac{1}{4}$ to $\frac{3}{4}$ inch broad.

Limestone cliffs in Eastern Iowa.

The features which distinguish this from the typical form are the single fibro-vascular bundle of the stipe without an anterior nation of sclerenchyma, thinner and narrower fronds, simpler vethread, acute base, shorter sori, and the greater differentiation of sterile and fertile fronds. Of these characters the most pronounced are the bundle of the stipe and the base of the blade.

It is a significant fact that the deviations from the type are all in the direction of the only other known species of the genus, *C. Sibiricus*, a native of northeastern Asia. So considerable is the approach toward that species that if our plant had been found in company with the foreign instead of the home sort, I doubt not it would have been set down as a genuine variety of the former. I have not, however, seen specimens of *C. Sibiricus*, and cannot speak with perfect confidence, but form my judgment from the extended and very complete description given in Milde's *Filices Eu. et Atlan.*, and the figure in Hooker's 2nd *Century of Ferns*. Professor Eaton writes me that a specimen in his herbarium corresponds closely with Hooker's illustration except it is not so large. The opinion of Linnæus that only one variable species of *Camptosorus* exists, may again find favor. At any rate the form under discussion is quite intermediate between the two established species. One character, however, yet to be mentioned, marks the closer affinity with *C. rhizophyllus*. It is the widening of the blade above the triangular base. By referring to the illustration, the slight lobation of the blade at the widest part is evident in every frond. These incipient lateral lobes are not auricles, but are of the nature of

the lateral prolongations occasionally produced by *C. rhizophyllus*, and well illustrated in Eaton's *Ferns of North America*. In *C. Sibiricus* both the auricles and the lateral developments are wanting, and the greatest breadth is still farther from the base of the blade. The character of the axial bundle is very marked, and should not be disregarded.—J. C. ARTHUR.

EXPLANATION OF PLATE III.—An entire plant of natural size showing four sterile fronds and a small fertile frond.

A single fertile frond of natural size with a plantlet growing from the apex.

Portion of the same frond enlarged six diameters, showing the venation and position of the sori.

Cross-section of a fertile stipe magnified thirty-five diameters, and drawn with camera lucida.

Notes on the Virginia Creeper.

A number of years ago I communicated to the *Academy of Natural Sciences of Philadelphia* the fact that every third node had one tendril, and that the leaves opposite the tendrils had no axillary buds. About the time of the publication of my remarks I twitted in pleasant vein the author of "*How plants Behave*," with inaccuracy, because the cut at p. 17 had an axillary bud opposite to a tendril. To my amazed discomfiture he replied by sending me a fresh specimen just like his drawing! It was a good lesson to me on the use of "never" by a botanist. I have since seen such cases, but very seldom. The rule is as I then noted. In the Japan species, *Ampelopsis tricuspidata* (*A. Veitchii* of gardens), the rule is the same. Mohr, a German writer on the grape vine notes that there are regular intermissions of tendrils in the grape vine, and Dr. Engelmann since, but I believe quite independently, observed the same, and at one time believed the fact might be made of value in the diagnosis of species. Much does not seem to have been made of it however in this direction. In the grape there is not the same constancy in the numerical order as in the Virginia Creeper. In *Vitis indivisa* I find a tendril at every node. In other species of *Vitis* and *Ampelopsis*, there are irregularities.

It is worth noting how *Ampelopsis quinquefolia* varies. In 1871 and '73 I collected it in the vicinity of Pike's Peak with narrow, laciniate, and somewhat glaucous leaves. Mr. Buckley notes it in Texas as often bearing seven leaflets, where it is his *A. heptaphylla*. In Canada I find six leaflets common, with often the rudiments of a seventh. In the upper Delaware regions I have often gathered them with but three. In Pennsylvania the chief veins diverge and curve as they approach the margin. At Niagara I found them as nearly parallel and straight as in a horse chestnut. A first glance at one on Goat Island once, as it ran over a tree, gave me a pleasant surprise that I was looking at an *Æsculus*.

Some years ago a large *Ampelopsis* covered a *Cerasus serotina*

on my grounds. The cherry died, and in a few years the bark and wood rotted. Where this occurred the old stem of the Virginia Creeper commenced to send out rootlets. These rootlets seem to die annually, as they do in *Rhus radicans*. The main stem is a mass of rootlets. I have observed that the plant does this sometimes in the shade on stone walls, and at times when there is not so much shade. Perhaps some plants or some forms may have a greater tendency to root than others.

Another curious thing is that when the Virginia Creeper sends out these aerial rootlets, the wood has excentric circles, as the poison vine always has.

A matter which has interested me is the manner in which the branchlets disarticulate in the fall of the year. When a Virginia Creeper reaches the top of its support, it sends out weak laterals. In the fall these are all thrown off down to the lowermost bud. In other words the lateral branches increase only by the addition of one node a year. Remembering however the above cited tilt with the author of "*How plants Behave*" I must protect myself by remarking that though I say "these are all thrown off," I should not be surprised if some one were to show me a case where it is not so.

These observations have been recorded from time to time as made, in the Proceedings of the Philadelphia Academy. As recent attention has been drawn to the plant, it may be useful to present all in one chapter.—THOMAS MEEHAN.

Plants of Belle Isle, Michigan.

Detroit, the most beautiful city of the West, has the honor of possessing what will some day be one of the most delightful parks. It is the Belle Isle, situated a few miles up the river and connected by constantly going steamers with the wharves of the city. It is still in an almost primitive condition and certainly must be a treasure to the botanists of Detroit, affording a vegetation at once varied and quite free from the introductions that attend the progress of civilization. This is the locality from which Bigelow obtained his specimens.

A few steps from the landing at the island, *Lythrum alatum*, *Potentilla Anserina*, and *Lathyrus paluster* were growing abundantly. A few rods beyond the bath houses *Habenaria leucophæa* everywhere threw out its spikes of fringed flowers from among the grasses. *Rubus occidentalis* appeared this time with an amber colored fruit, escaping the attention of groups of children busy in collecting the more common black variety. *Rosa setigera* was constantly in demand for the rural bouquets of excursionists, which seemed to have no definite size, but always had room for one more *Habenaria*, *Lysimachia stricta*, *Lobelia spicata*, or *Hypericum perforatum*. On the drier ground we saw *Geum strictum*, *Lobelia in-*

flata, *Calamintha Clinopodium*, besides numerous ferns and other plants, which, however, have already been credited to this part of Michigan in Wheeler and Smith's catalogue. Near the water works, east of the city, *Zizania aquatica* grew among millions of *Wolffia Columbiana*, interspersed with *Lemna trisulca* and *L. polyrrhiza*, which the catalogue indicates as growing throughout Southern Michigan. *Sonchus oleraceus* was represented by a few stray individuals; also *Polygonum Pennsylvanicum* and *P. incarnatum*. Among the more common weeds may be mentioned *Cichorium Intybus* and *Atriplex patula*, var. *hastata*, both of which are found in unusual abundance throughout the city. Along the railroads *Œnothera biennis*, var. *muricata*, *Diplopappus umbellatus* and *Cenchrus tribuloides*, were well represented, the last plant ve rytroublesome to the collector. A few other plants may be mentioned, which were found north of the city; *Solidago ulmifolia*, *Rudbeckia speciosa*, *Lactuca leucophæa*, *Spiranthes Romanzoviana*, *Botrychium ternatum*, var. *obliquum* and var. *dissectum*. The flowers of the *Spiranthes* wind in three ranks about the stem, but they are so arranged as to form 4 vertical rows in each spike. I also observed that young individuals were developed from the axils of the lower leaves, which I suppose furnish a means of propagation to the plant.—it being well known that most orchids are slow to seed, requiring the agency of insects in securing fertilization. Proliferous specimens of *Scirpus atrovirens* were frequently seen in the fall.

Fungi were rather scarce. However, the species found were abundantly represented. Among these were *Scleroderma vulgare*, *Geaster triplex*, Jungh., *Bovista plumbea*, Pers., *Cyathus striatus*, Hoffm., *Boletus castaneus*, Bull., *Agaricus confluens*, Pers., and *Agaricus radicatus*, Bull.—AUG. F. FOERSTE, *Dayton, Ohio*.

Notulæ Californicæ.

The plant commonly known as German ivy (*Senecio mikanioides*, Otto) acts much as if it could become naturalized in California; though thus far one does not see it growing wild except along streams, and in places where its shoots may have found a lodgment after having been thrown away with the refuse of the gardens. But it is already of quite frequent occurrence in the ravines back of Oakland and Berkeley, where it flowers regularly and profusely shortly after Christmas.

Its dense masses of yellow bloom, upon the background of the dark foliage of live oak and bay over which it climbs, give a warm and cheerful look, at this season when flowers are few.

Owing to the climatic peculiarities of the past winter the common deciduous shrub, *Neillia opulifolia*, Benth. & Hook., will have shed its foliage twice in 1883. Its habit is, in this region, to put

them forth in the month of March, and mature and cast them off in September. But last autumn we were visited by very early and continuous rains, accompanied by warm weather; insomuch that this particular shrub in November unfolded its new leaves, and showed its flower buds. By the beginning of January, when the flowers had appeared, there came suddenly a very marked change in the temperature. The frosts killed the flowers; but the young leaves, barely full grown, seemed uninjured; but as late as February they turned red, and fell, as they are wont to do in autumn. Now, in the middle of March, they are appearing again, as boldly and vigorously as if nothing unusual had happened.

It is remarkable that no other of the ten or fifteen species of deciduous shrubs, inhabiting these same banks, were similarly affected by the season. *Ribes Menziesii*, Pursh, which is about the earliest to respond to the call of spring, and also the earliest to drop its foliage, remained wholly unmoved by the extraordinary vernal influences of last October and November, and is now in flower at its usual date; and the same is true of all the rest, with the single exception of *Symphoricarpus racemosus*, Michx. This shrub unfolded its leaves in November; but the subsequent frosts neither killed, nor yet matured them; their growth was only temporarily checked; and although it was for two months, they have lately attained their full size, and the shrub will flower at its usual time.

Of *Anthemis Cotula*, L., it is said in Bot. Cal. I. 401, that it is "sparingly found along roadsides: introduced, but not yet common." That was six or seven years ago; and now it is fairly abundant—too much so—whitening not only waysides, but waste grounds everywhere almost on the east side of San Francisco Bay. Moreover, like death, it has all seasons for its own, in California, for it may be found in flower every month in the year.

Although I have seen no specimens, I have it from two authorities which I deem wholly unquestionable, that the common foxglove (*Digitalis purpurea*) is not only thoroughly naturalized, but abundant far inland, in the country back of Humboldt Bay.

The most interesting waif which I have detected in the San Francisco region is a *Hemizonia*, one of the tarweeds, peculiar to this coast, which I found in a single specimen, on the Oakland pier in the summer of 1881. Being wholly distinct from all the species of its genus known to me, I made specimens, preserving every branch of the single, large plant; supposing, nevertheless, that it would prove to be some common species of the south part of the state, which had found its way hither by ship or rail. After keeping my specimens nearly two years, and having meanwhile collected and published half a dozen new ones of the same genus, I lately made a careful examination of this my neglected ballast waif, and found that it was also an undescribed species. I immediately

named it as new, and sent a branch to Dr. Gray, who writes back that it is his unpublished *H. Wrightii,* which he had obtained from San Bernardino through Mr. W. G. Wright, only a year earlier than the date of my collecting it as a waif five hundred miles from its home. The seed, from which my waif specimen was produced, came probably by rail; for it was at the terminus of the railroad route that I found the plant.—EDWARD LEE GREENE, *Berkeley, California.*

Botany at Harvard University.

The following brief notes, taken while spending the winter at the Botanic Gardens, will give the readers of the GAZETTE an idea of the nature and method of instruction given in this branch of Natural History at Harvard University.

Botany is one of the many *elective* studies which the whole course contains, so that all who begin it do not necessarily finish it. The course in elementary botany begins about October 1, and continues throughout the year. It consists, first, of practical exercises in analysis, by which means the student is made familiar with the process of determining plant names. This is done by analyzing, first some of the more common, regular, symmetrical flowers, and afterwards the irregular ones, such as some of the large *Compositæ.* Practical exercises are then given in the use of the analytical key, by which the student is made familiar with the process of tracing plants to their proper places in the Natural Orders. The next subject is to consider the different parts of the plants, following the plan given in Gray's Structural Botany.

Each student is required to work six hours a week in the laboratory, with a dissecting microscope. The last half of this course is devoted to the study of the Natural Orders and the useful plants which they contain, accompanied with the study of the most striking phenomena of vegetation.

At the beginning of the second year, the class take up the study of biology, pursuing a course rather more extensive than that given in Huxley's Elements of Biology; beginning with the lower Cryptogams, such as Bacteria, the different Moulds, etc.; passing to the higher forms, making a thorough study of the Ferns; finishing the first half with the study of Histology. During the second half year the class is given a thorugh course in experimental vegetable physiology, and systematic botany. In this course, besides the collection and identification of plants, each student is furnished with a compound microscope, and is required to spend at least six hours a week, during the last half year, in laboratory practice, in the examination of important orders, giving results of experiment with the different apparatus at his command. The

laboratory work in both the elementary and advanced classes is accompanied with lectures twice a week upon topics similar to the following:

Structure of, and useful plants in, Polypetalous, Monopetalous and Apetalous divisions.

Same in regard to Gymnosperms.

Morphology of Bracts, and an examination of inflorescence.

Morphology of calyx, corolla, stamens, carpels, ovules, seeds and fruits.

Movements in plants.

General laws of adaptation in the vegetable world.

Plants of former times.

Plants of extremes of climate.

Plants of the temperate zones.

General laws of plant distribution.

Relation of plant structure to functions.

Relation of plants to water; percentage of water in composition; root absorption; absorption by other parts; transpiration and its results; selection of dissolved salts and their appropriation by the plants.

Soil, its physical and chemical structure.

Relation of plants to the atmosphere; gaseous absorption; transfer of gases in plants.

Assimilation; structure of the leaf; chlorophyll, its properties; relation to light; products of assimilation; effects on the air; storing up of elaborated products.

Metastasis; changes which elaborated products undergo in the plant.

Production of active principles: relations of this to heat.

Respiration in plants.

Nitrogenous food; insectivorous plants.

Phenomena of growth.

Laws of growth.

Movements; autonomic; following shocks; associated with growth.

Buds and their transfer.

Fertilization in gymnosperms.

Fertilization in angiosperms; color, fragrance, etc., in flowers.

Fertilization; close, cross and hybridization.—J. TROOP.

Remarks on Dentaria as a Subgenus of Cardamine.

Bentham and Hooker in their "Genera Plantarum" have united *Dentaria* with *Cardamine*, arranging the species of the former as a subgenus under the latter. This, with our species, was done by Alphonso Wood in his "Botanist and Florist" in 1870, and he is credited with the names under *Cardamine*.

The only differences between the two genera, at least so far as

our species go, are in habit, the stems of the first being generally naked below and the second being leafy, and in the seeds of *Dentaria* being on broad, and of *Cardamine* on slender stalks.

The species of the eastern United States are in need of revision and the following is submitted to the consideration of botanists.

1. CARDAMINE DIPHYLLA, Wood. Rootstock long and continuous; toothed; stem leaves two.

2. CARDAMINE HETEROPHYLLA, Wood. Rootstock interrupted, forming a chain of two or three narrow oblong toothed tubers; stem leaves two to seven, mostly three, alternate.—The forms with more than three leaves are *Dentaria maxima*, Nutt.

This and the next species it would sometimes be hard to separate, for the next is sometimes found with two leaves, and sometimes with three and these alternate instead of whorled.

3. CARDAMINE LACINIATA, Wood. Rootstock same as last; leaves mostly three in a whorl, sometimes only two.

Var. MULTIFIDA, James. Leaves two or three, alternate or whorled, the leaflets with narrow linear lobes.

I do not think this form, called *Dentaria multifida*, Muhl., can be be separated with justice from the *laciniata*. In a recent trip to Lookout mountain, Chattanooga, I found both forms in full bloom, although not growing together, and some were so exactly intermediate in the division of the leaflets that it was hard to decide what they were. The rootstocks of both are alike. The variety however grows in poorer soil than the species itself, and we can thus account for the finer division of the leaves. To take the extreme form of the species and the variety and compare them, one would be inclined to give to each specific rank, but when we find them shading into one another as gradually as they do, we can see no other plan than to consider the *multifida* as a variety of *C. laciniata*.

The other species of *Dentaria* of the United States will now be *Cardamine Californica*, *C. macrocarpa*, and *C. tenella*.

I have specimens of var. *multifida* and many other specimens for exchange for my desiderata.—JOS. F. JAMES, *Custodian Cin. Soc. Nat. Hist., Cin., O.*

GENERAL NOTES.

Viola Beckwithii, T. & G., var. trinervata. This pretty little violet was first collected near Goldendale, Wash. Terr., April 1, 1878, and at different times since, and has been distributed in my sets as *V. Beckwithii*, var. The characters of this new variety may eventually entitle it to specific rank, but for the present it is retained under *V. Beckwithii*. The principal characters are in the more simply pedate leaves, with broader lobes, having remarkable callous tips, and three prominent nerves, very strong in the mature leaves, the lateral pair submarginal, sometimes five nerves, when the outermost are strictly marginal.

THOS. HOWELL, *Arthur, Oregon.*

Solanum Fendleri.—This, one of the new Mexican tuberous species, was given to me many years ago by Dr. C. C. Parry. I found the tubers quite hardy here in Philadelphia, which of course the common potato is not. It came up among the hardy border flowers several years in succession, and finally disappeared, probably through ground mice. Some of the roots developed to the size of Black Walnuts before I lost them. It was on this experience only that I thought Mr. Lemmon's discoveries may be of advantage. I have not seen his plants, nor do I know what species he discovered in Arizona.—T. MEEHAN.

Sensitive Stigmas of Martynia.—In *Martynia proboscidea* the stigmas, when touched, close quickly, probably within ten seconds (I regret not having timed them), but if there is no pollen between the lobes these soon *reopen*, and this may be repeated several times during the life of the flower; but if there is pollen between the lobes they *never* reopen. If a bee enters one of these flowers, without having previously visited another, he closes the stigma without introducing pollen and it soon reopens. But if he has previously visited another flower and is covered with pollen, he introduces some of it between the lobes of the stigma, which then never reopens. This may have been observed before, but at all events I think it will be worthy of note as a remarkable adaptation for cross-fertilization.—EDGAR B. HARGER, *Oxford, Conn.*

The Arizona Potato.—I have been quite interested in Mr. Lemmon's discovery last July of *Solanum tuberosum* in the Huachuca Mountains, Arizona, in flower, and later in fruit.

Turning to my herbarium I find I have recorded on the label to my specimen, "*Solanum tuberosum*, L., var. *boreale*, Gray. Syn. Fl. p. 227. Mt. Graham, Arizona. Alt. 9250 feet." The specimens were taken in August 1874 and were beyond doubt indigenous. They were in flower but some had tubers about three-fourths of an inch in diameter.

This variety Gray recognizes as his old *Solanum Fendleri*, and states distinctly that it is not specifically distinct from the potato plant.

There can be no question that henceforth we must regard the potato as an indigenous plant, in the mountains of our Southwest.—J. T. ROTHROCK.

Dr. Torrey. I was employed by Dr. Torrey, during the last year of his life, in some small botanical details of his herbarium, and then I had an opportunity of noting his marvelous skill in mechanical resources. It impressed me the more, perhaps, as nature has not endowed me in this way. During my sojourn at Columbia College, I saw the dear old man in the most intimate way, and loved him as did all his associates. Often returning to my room late at night, I have found the Doctor hard at work in the herbarium, all the windows shut down in the August heat, and he himself in his shirt sleeves. He preferred to suffer rather have his plants disarranged by the wind. Pointing to the well-loaded shelves of his priceless herbarium, he once said to me with his quaint, child-like manner, "That represents a deal of back-ache." I have since learned to appreciate the remark.—W. W. BAILEY.

Stamens of Heteranthera reniformis.—Mr. Fritz Mueller writes to *Nature* describing dimorphism exhibited by the stamens of *Heteranthera reniformis* and commenting on the probable benefit of such dimorphism. He says; "In *Heteranthera reniformis* there is one long stamen (belonging to the outer whorl) having pale bluish pollen, and two short stamens (of the inner whorl) with bright yellow pollen. The stigma stands generally on a level with the anther of the long stamen. When the white flower opens, the pistil and long stamen diverge, the pistil bending (almost without exception) to the right, and the stamen to the left; at the withering of the flower, they again approach each other, so that the stigma may be fertilized by the pollen of the long stamen. Visiting insects are attracted yet more to the yellow anthers of the two short stamens by their being placed close to a yellow spot, surrounded by a violet border, at the base of the upper petal. * * * * Fertilization is almost exclusively effected by the pollen of the longer stamens, while the shorter stamens serve only to attract pollen-gathering or pollen-eating insects. * * * The dull color of the long stamens serves to make them less visible to insects."

A New Puff-Ball.—In a recent number *Grevillea*, Dr. M. C. Cooke prints the description of a new puff-ball, from Ohio, which is of exceeding interest. It belongs to a long lost genus, described by Klotsch in "Linnæa" some fifty years ago and a puzzle to mycologists ever since. The following is the description:

CYCLODERMA OHIENSIS, *Cke. & Morg.*

Subglobosum, album, læve. Peridium glabrum, coriaceum, superne umbonatum, inferne radicoso-fibrosum. Columella subcylindrica, æqualis, capillitioque radiante alba. Sporis minutissimis, globosis hyalinis.

On the ground. Ohio, U. S.

About an inch in diameter, or less, columella two-thirds the height of the peridium, wholly white within.

The double peridium is very distinct, especially as the individual advances in age. The outer peridium is composed of rather coarse, irregular, contorted fibres, closely interwoven. The capillitium is an exceedingly delicate membrane, much folded and plicate. The spores are globose, hyaline, and very minute.

Some Popular Botany.—A writer who affects the style of Thoreau, gives us, in the March number of the *Century Magazine*, some curious notes on the habits of evergreen and deciduous trees. He takes occasion to say that "most persons are unreliable observers," a statement somewhat lacking in originality, but which connot be gainsayed. "People live in the country all their lives without making one accurate observation *about* nature." (May I suggest in extenuation that "observations about nature" at so mnch per page in a popular magazine pay better

than that modest, reticent study *of* nature in which many country people nevertheless indulge.)

"The evergreen trees in front of their doors, what do they know about their habits? Do the pine and hemlock shed their leaves? Not in any strict sense." May I ask in a vague sense what they do with them otherwise? "In the deciduous trees the new leaves *take the place of the old* (sic), *they come out in the axils of the old leaves* and the branch is reclothed each spring, even if no new shoots appear"!! Dr. Gray says that whatever is produced in the axil of a leaf when developed is a branch but then Dr. Gray may be one of those unfortunates who miss their fact for lack of "a sharp eye" and capacity for "swift inference." "But none of the Coniferæ renew their leaves as do the deciduous trees." "If the tree (conifer) were to cease to grow it would probably (though of this I am not certain) cease to shed its leaves." Nothing like caution in stating a scientific hypothesis, but what sense is there in the foregoing? It may be said that a writer who uses language in such a loose way as to talk about the "molting season" of trees and "foresight in a weed" is not to be held to a close verbal construction. But the context of the passage from which I have quoted shows an effort toward hypercritical accuracy on the part of one who "holds his eye long and firmly to the point and will not be baffled."—A COUNTRYMAN.

Water Pores of Fuchsia. In Bessey's Botany (1st Ed., p. 104) Mr J. C. Arthur figures a water pore from a leaf-tooth of *Fuchsia globosa* and mentions the fact that in the dark colored varieties there are several of these openings on each tooth. The accompanying figure illustrates a group of these as shown by a slide prepared by Miss Katie L. Bishop in the botanical laboratory of Purdue University. The number of these water-rifts is unusually large, seven surrounding *a*, the central pore, which commonly occupies alone the tip of the tooth. Several slides were obtained, showing two or three of these openings, but none approaching the number here figured. Inasmuch as the literature and illustrations concerning this subject are so very meager it is hoped that this figure, though not representing any great novelty, may be of use to whoever undertakes a fuller study of these interesting structures. C. R. B.

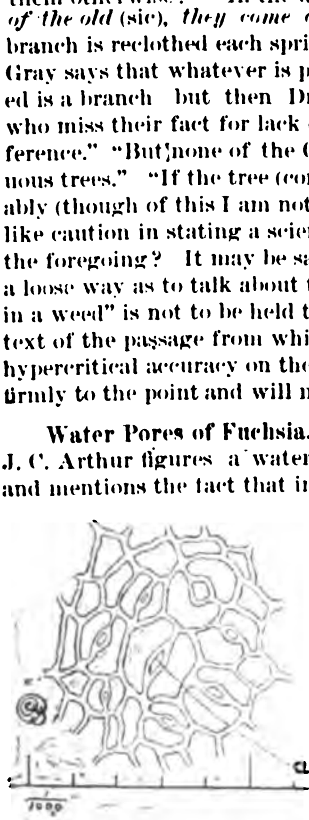


Fig. 1.—Water pores from tip of tooth on leaf of *Fuchsia* (sp.?). *a*, central pore.

Schedule for the study of Cyperus. I have found the schedule plan of approach so useful with difficult orders and genera that I constantly extend it to the examination of others. The young student is apt to see in a sedge or grass so much at once that is new and confusing that he may abandon the work in despair. If, however, he carefully writes

out the account of one thing at a time, he eliminates the element of doubt, as well as the too natural desire to compel the plant into some corner where his preconception supposes it to belong. Morever, by this plan, he actually studies the plant and bears away an idea of its structure and affinities, rather than a mere name. I have found the accompanying schedule for the genus *Cyperus* so useful in practice that I am induced to communicate it for the benefit of other teachers of our science.

SCHEDULE FOR CYPERUS.

The Roots. Note their character as indicative of the duration of the plant.

The Rootstocks. Note if present and whether tuberous.

The Culms. Describe as to section, height, surface and color. Are they slender or stout?

The Leaves. Describe in ordinary terms of the leaf.

The Involucre. Of how many leaves is it formed? Describe these and state their length as well as the number and length of those of

The Involucels.

The Spikes. Are they in simple or compound umbels? Are they flat or terete? Give their general shape. Are they many or few-flowered? Are they appressed,spreading,or reflexed? State their color. Is the axis winged or naked?

The Scales. Describe their shape, margin, and apex. Note if they are empty. Are they keeled or not? Are they appressed or spreading? Are they nerved or not? Are they deciduous or persistent?

The Stamens. Give their number.

The Styles. How many times are they cleft?

The Achenium. Is it lenticular or triangular? Describe its general shape, and tell whether or not it is pointed.

The above is introduced by a general talk about the genus, with illustrations and diagrams. It has been put to the test of laboratory practice and stands the ordeal well. W. W. BAILEY, *Brown Univ., Providence, R. I.*

Anthesis of Cyclamen. I have been much interested in watching in my window garden the anthesis of this beautiful plant. At first it consisted of nothing but a thick cluster of heart-shaped or almost reniform radical leaves rising from a half buried corm, which, we are told, has been developed even in the seed. Hidden among the leaves could be found numerous nodding flower buds, giving but little promise of their future beauty. For several weeks the plant seemed to be engaged in storing energy, no surface change appearing. Suddenly the one-flowered peduncles began to elongate and grew with wonderful rapidity, carrying the buds far above the leaf cluster, until a length of 8 or 10 inches had been attained. In some cases all this growth was accomplished in

24 or 48 hours, the stem increasing in diameter as well as in length; in other cases it took longer. No finer example of rapidly dividing cells can be obtained anywhere than is furnished by these elongating peduncles. Then comes another resting period, after which the convolute petals begin to elongate, gaining nearly their full length while still rolled together. Presently a loosening up is noticed near the middle of the roll of petals, the edges beginning to free themselves from any overlapping and thus giving elbow room for the next movement. As is very well known the petals are strongly reflexed, just as in *Dodecatheon*, and I was somewhat curious to see how the reflexing took place. Closely as I watched, several buds opened without my catching a glimpse of the manner; but finally I was rewarded by seeing the reflexed position gained in a variety of ways. The usual way seems to be for the two upper petals to fly back suddenly like liberated springs, and the remaining three to come back slowly one at a time, with an almost imperceptible movement, always in the same order, the innermost petal being last. Sometimes, however, all five spring back at once, spreading out like the rays of a star, and then usually the two upper ones become at once completely reflexed, leaving the other three to assume the position gradually. There seems thus to be a combination of a simple mechanical movement, the sudden springing from a confined position, and a vital movement which brings the released petals slowly back to the required position. Mr. Darwin[1] has spoken of the movement of the peduncles in bending downward and burying the pods and this movement was beautifully shown in the specimens examined, and the circumnutation was also very noticeable. Circumnutation in the slow movement of the reflexing petals is very evident, as they describe quite a sensible arc before settling into their permanent positions and even then continue it and become quite twisted. This might partly be due to their having been in the convolute arrangement in the bud, but this cannot entirely account for it, and may not this very convolute arrangement look to circumnutation at least as an abettor, and the tension which causes the upper petals to spring back when released be stored up by its restraint? So then this same *Cyclamen Persicum*, which yielded to Darwin illustrations of movement in cotyledon, peduncle, and leaf, continues the story in the petals.

It might be interesting in this connection to note the presence of cleistogamous flowers. In some the peduncles never elongated, but in one it grew as rankly as those of other flowers, and one stunted petal crept out of the calyx-tube, but that was all. The stamens though were full to bursting of pollen, which does not look like cleistogamy, and the pod was the best formed of all and full of seed. It would seem as if all the cleistogamous flowers should have elongated peduncles if the habit of burying the pods is to be preserved.—J. M. C.

[1]Power of movement in Plants, p. 433.

EDITORIAL NOTES.

MR. W. C. WERNER, of Painesville, Ohio, found, in 1881, specimens of *Lactuca Scariola*, L., along the L. S. & M. S. R. R., where it has settled down to stay.

FASCICLES X AND XI of Ellis' Fungi of North America will be issued soon. Fascicle XI is to be devoted to *Uredineæ*, and promises to be very interesting.

DR. H. CHRIST, Rue de l'Arbre, 5, Basel, Switzerland, is engaged upon a revision of the European Carices and desires to procure by exchange or purchase American specimens for comparison.

PROFESSOR BURRILL names the bacteria causing the blight of pear trees, the poison of poison ivy, and the epidemic disease of chinch bugs, respectively *Micrococcus amylovorus*, *M. toxicatus*, and *M. insectorum*.

H. PICK FINDS that the palisade tissue of the upper surface of leaves grown in the shade has shorter cells than that of similar leaves grown in the sunlight. In some cases the palisade cells were round or even elongated parallel to the surface.

DR. GEO. M. STERNBERG, of the U. S. Yellow Fever Commission, is preparing a work on Photomicrographs and how to make them, which will supply much needed information to those who desire to use this valuable method of illustrating what the microscope reveals.

DR. GOODALE has imported from Germany a number of pieces of very valuable apparatus for investigations in physiological botany at the Harvard botanical laboratory. It is the only collection of the kind in this country, and on account of its expensiveness will doubtless be so for some time.

MR. THOS. MEEHAN in observing *Stapelia bufonia* discovered that the axillary buds, in the normal condition of the plant, produce branches only, the flowers coming only from the weaker lateral accessory buds. But when the vegetative power of the plant is weakened, as by drying out, the axillary buds become the flowering ones,

MR. H. N. PATTERSON, of Oquawka, Ill., has ready for delivery his first box of North American genus labels, from *Ranunculaceæ* to *Compositæ*. 650 genera, 3 of each. We have never seen anything more neat and convenient and would most heartily recommend them to botanists as just the thing to paste upon their genus covers. The set mentioned above costs $1.30.

THE BULLETIN OF THE BUFFALO NATURALISTS' FIELD CLUB is the title of a new publication and a most creditable one it is. Nos. 1 & 2 are before us and contain among botanical articles, "The Dissemination of plants," by Miss Edna M. Porter, and "Adventives in East Buffalo," by J. F. Cowell. The "Botanical Notes" are mostly written by David F. Day, and of course are very interesting. We wish the new club every success.

AN INVITATION couched in graceful terms and written in the French language has been extended by the Imperial Society of Horticulture of St. Petersburg to all botanists, to attend an international Congress of Botanists and Horticulturists in that city upon the 5th (17th) of May. We learn from the circular that the official language of the congress will be French, but any one is free to express himself in his national tongue. The papers will be limited to 30 minutes. The distinguished committee who issue the call offer to facilitate the journey of every botanist by advice; and to make his stay in the capital agreeable. It is to be hoped that the United States will be represented.

CURRENT LITERATURE.

The Bacteria. By T. J. Burrill, Ph. D. From the eleventh report of the Illinois Industrial University. 8 vo. 65 pp., Springfield, 1882. —No subject connected with botany now commands more general interest, while requiring the highest technical knowledge and skill, than that of the bacteria. The present brochure of sixty-five closely packed pages is a timely contribution. It is specially to be commended as an entertaining and concise *resume* of the subject, both for the general reader only interested to know what bacteria are and how they affect domestic and commercial matters, and for the specialist who wishes the latest information. Dr. Sternberg's translation of Magnin's work is the only other treatise of the kind in the English language. The low price at which the present equally valuable work is issued (50 cts.) ought to ensure a wide perusal. The more serviceable part for the possessor of a good microscope is the systematic portion, filling half the pamphlet. This consists of keys to the genera, and descriptions of genera and species, with notes and synonomy. It is largely a conscientious translation of that part of the first number of Winter's edition of Rabenhorst's *Kryptogamen-Flora von Deutschland, Oesterreich, und der Schweiz* pertaining to bacteria (*Schizomycetes*) and to the closely related yeast plants (*Saccharomycetes*). This brings the most valuable classification with descriptions yet published within the reach of those unfamiliar with the German language. The author interpolates in brackets quite a number of doubtful or unsettled species mostly by Hallier, descriptions of three new species, and names for the species causing hog cholera and chicken cholera.

The Colors of Flowers, as Illustrated by the British Flora; by Grant Allen. (Nature Series, Macmillan & Co., London.)—

This little book deserves well its place in the popular "Nature Series" for it presents a theory in explanation of the coloring of flowers, which seems at first reading extremely plausible *a priori* and apparently so well borne out by the facts that one is almost tempted to accept it without examining closely the foundations on which it rests or the facts to which it appeals for support. The author's first task is to prove that, contrary to the commonly accepted doctrine of morphology, "petals are in all probability enlarged and flattened stamens, which have been set apart for the special work of attracting insects." As a corollary of this proposition it is stated that "as the stamens of almost all flowers * * * are yellow, it would seem naturally to follow that the earliest petals would be yellow too," and as "the earliest and simplest types of existing flowers are almost always yellow, seldom white and never blue, this in itself would be sufficient ground for believing that yellow was the orig-

inal color of all petals." The proofs relied upon by Professor Allen to sustain this position are chiefly three. First: the earliest flowers, i. e., those of the Gymnosperms, consisted only of naked ovules and clusters of stamens. Inasmuch therefore as sepals and petals are a later development than stamens and carpels, they cannot be said to show a transition between green leaves and the latter, as held by the Wolfian hypothesis. Second: stamens show a tendency to become petaloid, as shown by such flowers as *Nymphæa*, the *Mesembryanthemums*, orchids and others. Third: the occasional reversion of petals to stamens as in *Monarda* and *Capsella*.

Assuming the truth of the proposition that the original petals were yellow, the second and largest part of the book is devoted to showing the successive stages in the color-development of flowers, viz: (1) yellow, (2) white, (3) red or purple, (4) lilac, mauve, violet or blue. Examples from many families are adduced to show that the most specialized flowers of a single color are blue and the the least so are yellow. Variegated flowers are still more highly developed, the ground-color being usually some one of the higher series while the spots or lines are of one or more of the lower colors. The occurrence of yellow or white petals in conjunction with a high degree of specialization in other organs is accounted for by retrogression. "Flowers which have reached a given stage in the progressive scale of coloration often show a tendency to fall back to a lower stage." Green flowers (except in Gymnosperms) are explained to be the degenerate descendants of more gaily colored ancestors. Anemophilous green Angiosperms must therefore be considered as the development of flowers.

I have said that Professor Allen's hypothesis was plausible. It is more. Because of the pleasant style of the writer and the easy explanation he offers of those facts which he cites, it is fairly enticing. But there are some things in flower coloration and teratology "hard to be understood" on this theory. Some of Professor Allen's arguments if closely scrutinized, bear in themselves marks of weakness and others are so strained that they have almost passed their "elastic limit." It is hard to believe that amentaceous trees which appeared in the Cretaceous were a later development than the *Magnolia*, *Liriodendron* and Maple, with which, as far as Paleontology shows, they were contemporaneous. Further, if the *Gramineæ* and *Cyperaceæ* are degenerate descendants of some petaliferous liliaceous plant, it is strange that no traces of these ancestral forms were preserved, whereas in the upper Eocene beds are found fossil species of *Arundo, Carex, Cyperus* and *Poacites*. The objection that such ancestral forms as Professor Allen's theory needs did not grow in places where they would likely be preserved cannot be urged because the *Alismaceæ* (some form of which he thinks was the primordial lily) affect the same stations as the *Cyperaceæ*.

The fact that stamens tend to become petaloid, instead of helping the hypothesis that petals are flattened stamens seems rather to militate against it. That there is a constant tendency to reversion no one who believes in the doctrines of morphology will deny. It is certainly more reasonable to suppose that stamens are reverting to an ancestral form when they become petaloid, as they do in numberless instances, than to suppose that petals are reverting when in a *very few* cases they become antheriferous.

Again, upon the theory advanced how can the origin of sepals be accounted for? Were the primal sepals yellow or blue? or have they *degenerated* to a green color? Can anyone believe that when sepals and bracts become petaloid they are reverting to an *older* form.

While we cannot accept as reasonable the theory advanced for the

reasons stated above and because we doubt very much whether the facts if fully known would bear out some of the fundamental statements of the author, yet the book before us is certainly a most entertaining contribution to evolutionary botany and well worth a careful reading. (For additional criticism, see Dr. A. Gray, in Am. Jour. Sci., Mar., p. 236.)

ARTICLES IN JOURNALS.

Ascherson, P.—Review of C. and W. Barbey's "Botanizing in the Levant," *Bot. Zeit* Feb. 16; Review of the 5th volume of Boissier's "Flora Orientalis," l. c. Mar. 9.

Askenasy.—Review or Berthold's "Distribution of Algæ in the Gulf of Nepaul, etc., *Bot. Zeit.* Feb. 16.

Baker, J. G.—A Synopsis of the genus Selaginella (containing descriptions of 8 new species), continued, *Jour. Bot.* 21. p. 80.

Beal, W. J.—The movements of Roots of Indian Corn in Germination, *Am. Nat.* 17. 4. p. 412

Bennett, Arthur.—Two new Potamogetons (with plate), *Jour. Bot.* 21. p. 65.

Britten, James.—A review of Sir J. D. Hooker's "Flora of British India," part 9, *Jour. Bot* 21. p. 88.

Buchenau, Fr.—Review of "Alex Braun's Life as drawn from his writings," by G. Reimer, *Bot. Zeit.* Mar. 16.

Cheeseman, E. L.—An Alga in an Aquarium (with note by the editor), *Am. Mo. Mic. Jour.* 4. p. 41.

Cooke, M. C.—On Sphærella and its allies, *Jour. Bot.* 21. p. 67.

Eaton, D. C.—New or little-known Ferns of the U. S. No. 13. (in which is a description of a new Notholæna from California.) *Torr. Bull.* 10. 3. p. 26.

Farlow, W. G.—Notice of Rabenhorst's Kryptogamen-Flora, vol. II, parts 1-3, *Am. Jour. Sci.* 3. 25. p. 314; Notice of C. B. Plowright's "Heterœcism of Uredines." l. c.

Fayod, V.—Contributions to the knowledge of the lower Myxomycetes, 1 Plate, *Bot. Zeit.* Mar 16.

Fox Howard.—Influence of Environment on Plants (Brief note on flowering of Acacia dealbata), *Nature*, 27. p. 315.

Geyler.—Notice of A. Schenk's paper upon Medulosa elegans, *Bot. Zeit.* Feb. 23; notice of J. Felix's paper upon the petrified woods of Frankenberg in Saxony, l. c.; notice of Ferd. v. Muller's "New Vegetable Fossils of Victoria, l. c. Mar 16.

Goodale, G. L.—Notice of T.H.W Englemann on "Color and assimilation." *Am. Jour. Sci.* 3. 25, p. 312; Notice of E. Stahl "on the influence of Sunny and Shaded Localities on the Development of Foliage Leaves," l. c p. 313; Notice of Meehan on "Freezing of liquids in living vegetable tissue," *Science*, 1. 8. Note 507.

Gray, Asa, and J. H. **Trumbull**.—Review of De Candolle's Origin of Cultivated Plants; with Annotations upon certain American Species, *Am. Jour. Sci.* 3. 25. p. 241.

Hitchcock, R.—The Reticulate Structure of Living Matter (an excellent criticism of the "Bioplasson" theory), *Am. Mo. Mic. Jour.* 4. p. 48; Plants in Water at High Temperature, l. c. p. 57.

Kalchbrenner, C.—Communication on Mycology, *Flora*, Feb. 21.

Koehne, E.—Review of DeCandolle's "Origin of Cultivated Plants," *Bot. Zeit.* Mar. 2.

Kraus, Dr. Carl.—Inquiries upon the sap-pressure in plants, 3d paper, *Flora*, Feb. 21.

Kutscher, Emil.—Upon the function of tannic acid in metastasis, concluded, *Flora*, Feb. 11.

Magnus, P.—Notice of the report of the work of M. Gayon upon the physiology of Fungi, *Bot. Zeit.* Feb. 23.

Malan, Edward.—The Common Orchis (O mascula), with cuts, *Sci. Gossip*, No. 219. p. 52

Merrifield, Mrs. Mary P.—Cryptogamic Flora of Germany, Australia and Switzerland *Nature*, 27. p. 385.

Mueller, H Review of Grant Allen's "Colors of Flowers as illustrated by the British Flora," *Bot. Zeit* Mar. 16.

Mueller, Dr J.—Contribution to Lichenology, *Flora*, Feb. 11.

Nylander, W.—New European Lichens, *Flora*, Mar. 1.

Parry, C. C.—A new species of Oxytheca, *Torr. Bull.* 10. 2. p. 23.

Schimper, A. F. W.—Upon the Development of chlorophyll grains and coloring bodies *Bot. Zeit.* Feb. 16, continued Feb. 23, March 2, concluded March 9; with plates.

Scribner, F. Lamson.—A list of Grasses collected by Mr. Pringle in Arizona and California (in which are descriptions of 2 new species, a Diplachne and a Poa), *Torr. Bull.* 10 3 p. 29.

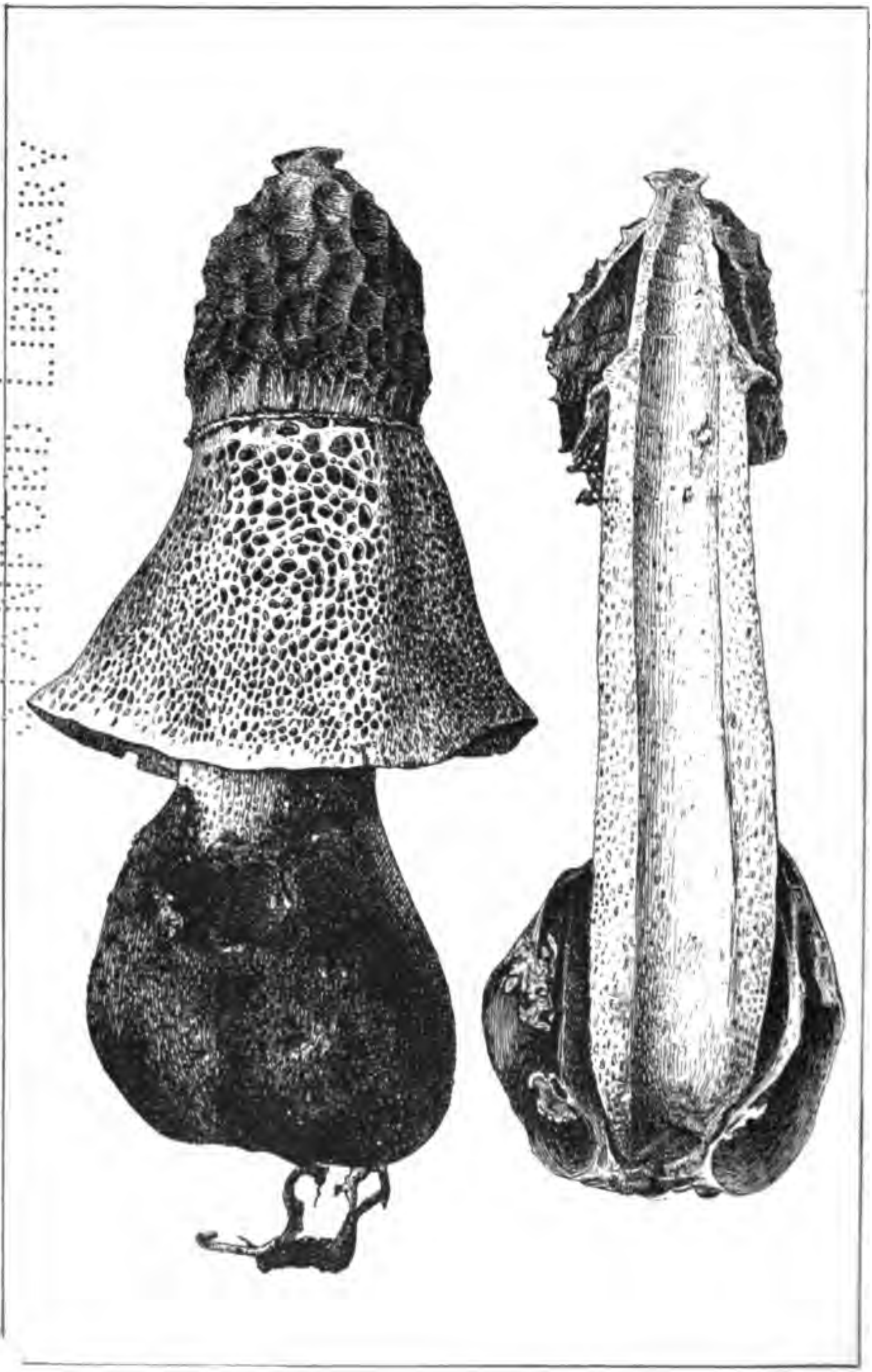
Spencer, James.—Recreations in Fossil Botany (Lyginodendron Oldhamium), with cuts *Sci. Gossip* No 219. p. 59.

Trumbull, J. H.—See under "Gray" above.

Tuckerman, Edward.—New Western Lichens (4 new species and one new genus, Pyrenothamnia by name), *Torr. Bull.* 10. 2. p. 21.

Vasey, Geo.—New Species of Grasses (2 species of Agrostis from the Pacific coast). *Torr Bull.* 10. 2. p. 21; On three Hybrid Oaks near Washington, D. C (with three plates), l. c. 10. 3 p. 25.

Wolle, Francis,—Fresh-Water Algæ (with plate), *Torr. Bull.* 10. 2. p. 13.



PHALLUS TOGATUS, KALCHBRENNER

BOTANICAL GAZETTE.

VOL. VIII. MAY, 1883. No. 5.

Some North American Botanists.

V. JACOB BIGELOW.

To the older botanists of New England the name of Jacob Bigelow early became a household word. His botanical work was done at a time when there was no professedly complete manual of the plants of the Eastern States in existence, and when no local floras of any extent had been compiled. The only scientific contribution toward a knowledge of the plants of New England was the catalogue published in 1785 by the learned and energetic Manasseh Cutler. The flora of Michaux was too general and ill-adapted for use as a practical manual. Marshall's Arbustum Americanum, which appeared in 1786, was little more than an annotated alphabetical catalogue of trees and shrubs, the most of which grew in Pennsylvania. The other contributions to a knowledge of American botany accessible to Northern students when Bigelow began to write, were nothing more than a few local catalogues and scattered articles in various publications, unless, indeed, we accept Prof. B. S. Barton's work on Elementary Botany, which appeared in 1803, and which, if it had little scientific merit, could at least claim the honor of being the first American text-book. With this meagre literature Jacob Bigelow began his botanical labors. He had been raised a farmer's boy, educated at Harvard, whence he graduated with honors, and had, in 1810, begun the practice of medicine in Boston. For some time young Bigelow was much exercised as to the choice of a profession, the college graduates of that day being limited to the three "learned professions," divinity, law and medicine. His natural aversion to medicine was removed by the eloquence and enthusiasm of Dr. John Warren, who delivered a course of lectures at Harvard each year on the subject. By teaching school and by various other means he succeeded in graduating from the medical department of the University of Pennsylvania in 1810 in his twenty-third year. At this University he formed the ac-

quaintance of the gifted Prof. W. P. C. Barton, from whom he obtained, as he said, "the rudiments of a botanical taste which adhered to me for many years." This Professor Barton published several works on American botany, the most pretentious of which was the uncompleted "Flora of North America," begun in 1821. The first manifestations of a taste for botany had been experienced by young Bigelow long before this time, however. He often told his friends that from his earliest years he watched every plant and wondered over the variety of vegetable productions. He once laughingly said to a friend that his first lesson in botany was from the "most learned inhabitant of Sudbury" to whom he carried a Star of Bethlehem to ask its name. The "learned inhabitant" replied, "Why, that's grass."

Dr. Bigelow gained little pecuniary benefit from his "tin sign," as he used to call it, for the first year after his graduation. In 1811, he became associated with Dr. James Jackson, and for nearly sixty years ranked next to his venerable senior, the most popular practitioner of the city. In 1812 he began, with Professor W. D. Peck, of the University, a course of lectures on botany. These lectures at once became very popular, especially those delivered by Dr. Bigelow, who possessed a most happy manner of illustration quite unknown to his colleague. "Finding that a considerable taste had sprung up among my pupils for the study of plants," he says, "I began to collect materials for a description of the native plants of Boston and its vicinity, which I published in 1814 under the name of 'Florula Bostoniensis.'" This was a bright 12mo. of 268 pages, containing 294 genera. Most of the plants described grew within five or ten miles of Boston, and were collected during the two preceding seasons. It was arranged entirely upon the artificial system. To each plant was added a concise and popular description. The difficult genera were not well represented in this first edition, for the author had not had sufficient time for studying them closely. Nor were the limits of species as closely drawn then as now. In a subsequent edition of the flora he remarks, under Aster and Solidago, that "there are a vast variety of hybrids and subspecies which the labors of botanists have not yet been able to reduce under permanent characters, though names without number have been applied to fugitive varieties. In this work I have inserted only the more distinct or leading species, from which a great part of the others in this vicinity are probably descended." Florula Bostoniensis may be said to be the first distinctive local flora published in America. It passed through three editions, the sec-

ond of which was for some thirty years the leading manual of the plants of the North-eastern States. Although much of the contents were compiled, the short diagnoses must have been original. These short descriptions so beautifully expressed and so accurately drawn from the best characters of the plant, made his work most deservedly popular. Soon after the first edition was published he began, with Dr. Francis Booth, the collection of materials for a flora of New England. The mountains of Vermont and New Hampshire were diligently explored, and considerable progress was made in the proposed undertaking. In the meantime Dr. Bigelow had been made Professor of Materia Medica and Botany in Harvard University, and had also received the appointment of Rumford Professor of Technology. Some of the publications of Muhlenberg, Nuttall, Eaton, and Torrey had also appeared, and with his limited time and the increasing literature before the people, he decided to abandon the New England Flora. The results of his study and investigations are easily traced in the second edition of his Florula Bostoniensis, however, which appeared in 1824. During the ten years since the appearance of the first edition he had collected materials for the description of 26 new species, of which seven still stand in our manuals, Ceanothus ovalis, Juncus militaris, Stellaria borealis, Actæa alba, Lathyrus maritimus, Spiranthes gracilis and Myriophyllum tenellum. He also made a new genus, Bootia, founded upon the Potentilla arguta of Pursh. Although still retaining its modest title, this second edition was a virtual manual of New England botany, describing 455 genera and no less than 1200 species. It will be remembered that Carex and other difficult genera had received little attention at this time. It was not until after the second edition had appeared that Professor Dewey began his writings on Caricography. A third edition appeared in 1840, with 29 additional genera, but with the general body of the work remaining the same. This was the last work in this country arranged upon the artificial system. While realizing fully the advantages of the natural arrangement, he still desired to preserve the uniformity of his work, and therefore adhered to the old method.

During the years between 1814 and 1824 Dr. Bigelow did most of his botanical work. Some idea of the versatility and genius of the man may be formed from the facts that he was at the time holding two professorships, both of recent endowment, was one of the physicians of the Massachusetts General Hospital, was carrying on a large private practice, was preparing a work

on the medical plants of North America, was elaborating the list and nomenclature of the Materia Medica of the first edition of the United States Pharmacopœia, was a member of a number of scientific and literary societies to which he made frequent and elaborate contributions, was in correspondence with nearly all the leading botanists of Europe and America, and withal often turned his attention to poetry and Latin composition. He also brought out an edition of Sir J. E. Smith's Introduction to Botany. He was one of the very first, if not the first, in this country to make a scientific attempt toward a medical botany. The only works on that subject previous to his time appear to be Benjamin Franklin's edition of an English work by Dr. Short, with preface, notes and appendix by John Bartram, issued in 1751, and an "American Materia Medica," wholly in Latin, published in Europe in 1787 by Dr. Schoeff. Dr. Bigelow's "American Medical Botany" was published in three volumes, from 1817 to 1820. Each volume contained an extensive account of twenty species, each illustrated by a colored plate. The properties of many of these species had received chemical manipulation at his hands, and had been used in his private practice. His work upon the Materia Medica of the United States Pharmacopœia, which appeared in 1820, was characterized by a most laudable departure from the old systems of cumbrous nomenclature. In all possible cases he employed a single name for each drug in place of the double or triple names previously in use, a plan which is still followed in our National Pharmacopœia. He followed up this labor by publishing his practical treatise, long familiar to the profession under the name of "Bigelow's Sequel," a succinct, judicious and perspicuous commentary on the characters, qualities and uses of the remedies adopted by the national medical representatives.

Dr. Bigelow's leading characteristic was the versatility of his genius. He was not only a botanist, but one of the most skilled physicians of his time, and adept in mechanics and machinery, and a most polished classical scholar. His works upon medical topics are among the most important ever written. As in botany, so in medicine, he was a pioneer, but in the latter case a pioneer to inaugurate a most radical reform in the practices of his time. All his medical writings bear strong evidence of his lack of faith in drugs and heroic remedies, and in the reliance he placed upon the recuperative processes of nature. Indeed, his work upon "Self-limited Diseases" is an avowed attack upon the old methods.

O. W. Holmes asserts that "this remarkable essay has probably had more influence on medical practice in America than any similar brief treatise, we might say than any work ever published in this country. Its suggestions were scattered abroad at the exact fertilizing moment when public opinion was matured enough for their reception." But the reforms inaugurated by Dr. Bigelow were by no means confined to the overturning the heroic treatment of disease. His printed productions and addresses which record his progressive views on paramount themes of professional interest cover a period of more than half a century. Most of these writings are collected in two volumes, "Nature in Disease" and "Modern Inquiries." Dr. Bigelow was the first to fill the chair of Rumford Professor in Harvard College, a professorship endowed by the famous Count Rumford for the purpose of teaching the application of the sciences to the useful arts. He is said to have been so fond of mechanical studies that every workshop passed upon his walks, and every mechanic with whom he conversed, were made to yield some new treasure to his stock of information. He was familiar with nearly every trade and nearly every mechanical process. When engravers and methods could not be found for illustrating his medical botany, he himself became inventor, and produced the method of *aqua-tinting* colors, a method which no doubt "would have passed into profitable use had not the invention of lithography soon afterwards superseded its employment." The results of his labors as Rumford Professor culminated in his exhaustive "Elements of Technology," which appeared in 1829.

But there was in practice another important error upon the overturning of which Dr. Bigelow concentrated the whole weight of his ability and influence—the existing practice of restricting education to ancient languages and to metaphysics. In the energetic stand which he took in this generous cause he excited immediate antagonism, and was often charged with bearing no sympathy for the languages, a thrust most wantonly false, for none knew them better than he, and few used them more skilfully. He objected to the time they usurped in the college courses, however, and his writings and addresses did much to institute a reform. He wrote two important essays upon this topic, "The Limits of Education," in 1865, and "On Classical and Utilitarian Studies," in 1866. This latter is said to be "the longest, the most elaborate and the most learned of his written productions."

Jacob Bigelow will ever be best and widest known, however,

through his efforts in establishing and perfecting the beautiful Mt. Auburn cemetery. He was the first in the world to conceive and to perfect plans for applying the appropriate art of landscape gardening to the adornment of the "city of the dead." From his first public effort in 1825, through the seven years in which he persistently urged the adoption of his plans, and during the half century which followed, he had the satisfaction of being known as the originator and strongest advocate of an art which he lived to see world-wide in its practice. When others took no interest in his measures, he himself became architect and gardener, and attended to all the details of the undertaking. One of his last labors was to devise a mammoth sphinx, which was sculptured in stone and presented to the cemetery as a monument to the soldiers who perished in the war. Ere the monument was placed on its site its venerable projector had been wholly deprived of vision, but with others' help he was raised slowly and enabled to pass his hands over the whole structure, that he might "see it by feeling." He compiled a little book descriptive of the monument, and sketching the propriety of transferring the emblem from Egypt to America. He also wrote an attractive volume giving a detailed history of the cemetery.

Dr. Bigelow had the highest appreciation of the beautiful in nature and the meritorious in literature and art. Always in love with nature, he named the walks and paths of Mt. Auburn after plants and flowers. Nothing could more fitly preserve his memory than its association with the vegetable world through the genus Bigelovia, which De Candolle bestowed, in 1836, upon some golden-flowered Compositæ. More than thirty American species have since been referred to this genus.

Dr. Bigelow early took to poetry, and at intervals during his life he wrote poems in English, Latin and Greek. A volume of his collected poems was anonymously published under the name of "Eolopœsis, American Rejected Addresses." When at last he became infirm and was confined to his room, he amused himself by translating into Greek and Latin verse the Mother Goose melodies, which he published under the title of "Chenodia." Toward the close of his life the bright intellect became dimmed, the lamp burned low, and on the 10th of January, 1879, in his ninety-second year, the last ember expired.—L. H. BAILEY, JR.

A New Phallus.

(PLATE IV.)

During the month of October, last year, I found, growing in a somewhat shady, grassy spot in the vicinity of Bethlehem, a group of three large specimens of a *Phallus* having a rather unusual appearance. Owing to the perishable nature of these fungi and the unsatisfactory method of preparing them for herbarium specimens, I determined to retain their important characters by means of a photograph. Accordingly a negative was taken of an entire specimen, representing the external appearance, and, by its side, a longitudinal section of another; the resulting photograph was very satisfactory, being five-sevenths of the size of the specimens.[1] In order to have the species identified I sent photographs with notes to our leading American mycologists, who were finally unanimous in pronouncing it most nearly allied to *Phallus Dæmonum*, Rumph., yet were doubtful whether it was identical with that species. In order to arrive at a satisfactory conclusion, I sent a photograph to Rev. C. Kalchbrenner, Hungary, who, in reply, stated that the very ample trumpet-shaped veil and small meshes are characters of sufficient importance to distinguish it as a new species, though he also recommended further careful examination of living specimens, in order more accurately to determine the distinctive characters of the species. The plants had a very disagreeable odor, equally as offensive as *P. impudicus*, Linn., which also occurs here. The spores are oval 1.5-2x3-4 mm. It differs from *P. indusiatus*, Schl., in having smaller meshes to the veil, besides that species is said to be odorless. I herewith present the diagnosis of the new species as drawn up by Rev. C. Kalchbrenner:

PHALLUS (HYMENOPHALLUS) TOGATUS, Kalchbrenner, n. sp. Volva crassa, subglobosa basi parumper applanata radiculis quibusdam laxe anastomosantibus aucta, superne in lobos irregulares rumpens, flava. Stipes subventricoso-cylindricus, apicem versus attenuatus, 5 6 poll. longus, pollicem crassus interstitiis irregulariter sparsis lacunosus, albus. Velum tubæforme ultra medium pedunculis dependens (conicum i. e. lateribus in limbo extrorsum curvatis) margine integerrimo interstitiis parvis, subrotundis, album. Pileo ovato-acuminato, anguste parvio, margine membrana plicatula adpressa aucta profunde scrobiculato-reticulato,

[1] The figures of the plate are the same size as those of the photograph.

olivaceo.—In locis graminosis, circa Lehigh University, Bethlehem, Pa. E. A. Rau, Oct. 24, 1882.

The photographs of this new *Phallus* were made by Dr. C. L. Lochman, Bethlehem, who has for several years past made excellent photographs of a number of the most important indigenous and exotic medicinal plants.—EUGENE A. RAU, *Bethlehem, Pa.*

Notes on Fresh-Water Algæ.

In relation to species of Algæ which produce what the Germans call "wasser-blüthe," or, in less poetical English, a scum on the surface of bodies of water which serve as water-supplies, there has of late been felt a great interest on the part of the public, and in this connection I would call attention to some interesting forms found in Minnesota last summer by Prof. J. C. Arthur. The two scum plants, so common in the Eastern States, *Clathrocystis æruginosa*, Henfrey, and *Cœlosphærium Kuetzingianum*, Näg., appear to be also common in the West and were found by Prof. Arthur in Lake Satakah and Lake Tetonka, at Waterville, Minn.; and the first-named species was also found by Prof. Wm. Trelease in Lake Mendota, Wis. Consequently, as the West becomes more thickly settled we may expect to hear of the same disagreeable pig-pen odor which is found in Eastern water-supplies during hot summers.

Prof. Arthur also detected an interesting alga floating on Lake Tetonka, Waterville, and Lake Phalen, near St. Paul, which has not as yet been found in Eastern water-supplies. The alga in question resembles *Rivularia atra*, Roth, but is of softer consistency and the filaments have a different micrometric measurement. The species of *Rivularia* grow attached to other plants, sticks, stones, etc., and although they at length become free, they are then found resting loosely on the bottom and not forming a scum on the surface of the water. In *Hedwigia*, Jan., 1878, Cohn described a *Rivularia* which he called *R. fluitans*, which formed a "wasser-blüthe" on the river Leba, near Lauenberg, in Pomerania; and in *Hedwigia*, March, 1878, Gohi mentioned the occurence of a similar *Rivularia* at Udrias, on the Gulf of Finland, to which he gave the name of *R. flos-aquæ;* but in *Hedwigia*, April, 1878, he stated that his plant was of the same species as that of Cohn. The *Rivularia* collected by Prof. Arthur in all essential respects seemed to me to be the same species

as that collected by Cohn and Gobi, and on sending a specimen to the last-named botanist he confirmed the correctness of the diagnosis.

Mixed with the Minnesota Algæ named above were fragments of an *Anabæna*, which appeared to be the form commonly known as *A. Flos-aquæ*, var. *circinalis*, and also traces of a larger *Anabæna*, the species of which could not be made out. In the Boston water works at South Framingham, Mass., *Anabæna gigantea*, Wood, was found in small quantity in the early part of November, 1882. I would also record the discovery of *Nostochopsis lobata*, Wood, by Messrs. E. Faxon and F. H. Hosford, at Ferrisburg, Vt., where it was comparatively abundant and formed expansions of several inches in water-courses. The occurrence of *Sphæroplæa annulina* should be recorded in California, where it was collected by Mrs. Austin near San Bernardino.—W. G. Farlow.

General Conditions of Spontaneous Protoplasmic Movement.

Dr. Chas. S. Dolley, of Rochester, N. Y., has just translated Th. W. Engelmann's paper upon the "Physiology of Protoplasmic Motion," which has attracted so much attention. The following are the general statements under the above caption:

1. Temperature.—For all contractile protoplasm there is a higher and a lower temperature at which the spontaneous movements cease under all circumstances. The minimum lies mostly in the neighborhood of 0°, the maximum generally about 40°(C).

2. Hygroscopicity.—In regard to this it is the same as regarding the temperature. There is, for all protoplasm, a maximum and minimum capacity for the inhibition of water. Close determination is wanting, yet the minimum may average below 60 per cent., and the maximum over 90 per cent. Within these limits the energy of the movements increases in general with the amount of contained water, with a corresponding increase of volume, and diminution of the refractive coefficient. Rapid change in concentration of the medium, causing rapid swelling, or more specially shriveling, acts in a manner similar to irritants.

3. Oxygen.—Protoplasmic motion is undoubtedly able to continue in a medium entirely free from oxygen, but for a short time only, at the most, some hours. The gradual stagnation can at first be overcome by the introduction of oxygen, and by this means alone.

GENERAL NOTES.

Fern Distribution in the U. S.—Mr. Geo. Davenport has read before the *Am. Phil. Soc.* a paper containing some comparative tables showing the distribution of ferns in the United States. This is in anticipation of the publication of a Text Book and Manual of the Ferns of North America, for which these tables were prepared. Some notes upon them will be of interest to all. Up to the date of publication (Feb. 2, 1883), the entire fern flora of the U. S. contained 162 or 164 known species. Of the States, New York leads with 52 species, followed by California with 48, Florida and Michigan with 47 each, Arizona with a probable 47, and Vermont with 45. Mr. Davenport thinks that owing to the contiguous unexplored Mexican territory, Arizona will lead all the other States in the wealth of her fern flora. The only other States containing 40 or more species are, Pennsylvania (42), Kentucky (41), Arkansas (41), and Connecticut (40). *Pteris aquilina*, *Adiantum pedatum*, *Cystopteris fragilis*, and *Asplenium Trichomanes* are probably the most cosmopolitan, and *Polypodium vulgare* has almost as great a range. Florida is distinguished in monopolizing all the species we have in six genera; these, of course, being tropical. The only other State which has the monopoly of a genus is New Jersey with its very local *Schizæa*. Only recently the discovery of *Scolopendrium* in Tennessee divided the honor of its presence with New York.—J. M. C.

Castor Oil Wood.—Soon after the completion of the University plant houses last spring, there were planted in the large central bed of the palm-house, for want of something more desirable, a number of different kinds of *Ricinus*. These were allowed to grow for seven months, when they were cut down to make room for other plants. At this time all of the twelve kinds were above fifteen feet in height, while the largest, the seeds of which had been received under the name of *Ricinus Africanus*, was eighteen feet in height, with a trunk fully ten inches in circumference at the base. Noticing the woody character of these trunks, which, for the first two or three lower joints, were unexpectedly solid and firm, with scarcely a trace of pith, some of them were seasoned, and have since been worked up. The wood is of light color, closely resembling basswood in appearance, but without any trace of concentric rings indicating periodic growth. Under the microscope the wood-cells are found to be of large size, with very numerous dotted ducts intermixed, while the medullary system is unusually well developed. To determine the character of the wood, some comparisons with other kinds have been made. Weight of a cubic inch of completely dried wood in grams: Red oak, 8.82; butternut, 7.12; sugar-maple, 11.21; white pine, 6.22; Ricinus, 4.53. Weight in grams of water absorbed by each block when immersed for several days: Red oak, 8.77; butternut, 7.78; sugar-maple, 8.22; white pine, 6.43; Ricinus, 14.44. Percentage of ash: Red oak, 0.26; butternut, 0.51; sugar-maple, 0.46; white pine, 0.11; Ricinus, 2.20. Specific gravity: Red oak, 0.5385; butternut, 0.4347; sugar-maple, 0.6843; white pine, 0.3797; Ricinus, 0.2766. In *Forestry Bulletin*, No. 22,

two kinds of wood are mentioned which have a lower specific gravity than Ricinus, namely, *Salix discolor*, 0.2259, and *Yucca baccata*, 0.2724. It seems worthy of note that a solid trunk of wood, three inches in diameter, even of no better quality than this, was grown from the seed in seven months.—A. N. PRENTISS, *Cornell University*.

The Shapes of Leaves.—Following is a résumé of a series of papers in *Nature* on the above topic, by Prof. Grant Allen. Like his other recent contributions to evolutionary botany, they contain the result of much careful observation and clever reasoning; and while we can not give assent to all his positions, we welcome the essays because they can not fail to stimulate inquiry in this much-neglected field.

I. *General Principles.*—The leaf is the essential and really active part of the vegetable organism. Its chief function is the absorption of carbonic dioxide from the air, and its deoxidation under the influence of sunlight. Two main conditions affect the shape and size of leaves: first, the nature and amount of the supply of CO_2; and second, the nature and amount of the supply of sunshine. There is a great struggle among plants for the CO_2 of the air, and through natural selection each plant tends to have its chlorophyll disposed in the most economical way for catching such sunlight as it can secure, and its absorbent surface so disposed as to catch such particles of carbon as pass its way. Each plant inherits a general type of foliage from its ancestors, and modifies it to suit the exigencies of its altered conditions. The actual shape is not always the ideally-best shape for those conditions, but it is the best possible adaptive modification of a pre-existing hereditary type. The venation tends most generally to reproduce itself under all varieties of external configuration. This venation is a fixed generic or tribal characteristic, and with very slight structural modifications we find great differences in the resulting outline. *Ranunculus aquatilis* has two forms of leaves, those floating on the surface full and rounded, the lower ones, like all submerged leaves, becoming minutely subdivided into long, almost hair-like filaments, in this simulating the streaming *Algæ* and *Characeæ*. Both forms of leaf preserve the ranunculaceous type in their venation.

II. *Extreme and Intermediate Types.*—Where access to sunlight and CO_2 is unimpeded in all directions the leaves tend to assume a completely rounded form. This condition is most common on the surface of the water, hence most water plants with floating leaves take this shape, e. g., *Lemna*, *Nelumbium* and *Nymphæa*. Occasionally this freedom is found among land plants, e. g., *Podophyllum*, *Tropæolum majus*, and *Hydrocotyle*. The common weedy plants, especially the annuals and non-bulbous perennials, which, growing thickly together, can not afford material to push broad leaves above their neighbors' heads, and are therefore compelled to fight among themselves for every passing particle of carbon, have their leaves very minutely subdivided, e. g., the *Umbelliferæ*. The whorling of linear leaves occasionally serves the same purpose as minute segmentation. Sometimes plants with ovoid leaves in a rosette insure them-

selves a good supply of carbon by keeping under all competitors by their close ufts, e. g., *Plantago major*.

III. *Origin of Types*.—There are two ways, according to Herbert Spencer, in which a stem may be developed from stalkless creeping fronds: first, by the inrolling or folding of the fronds forming a tube with adnate edges and resulting in the endogenous stem and monocotyledonous embryo; second, by the thickening and hardening of a fixed series of midribs, resulting in an exogenous stem and dicotyledonous embryo. Monocotyledonous leaves tend to show little distinction between blade and petiole, to assume a lanceolate or linear shape and parallel venation, because the fibro-vascular bundles will tend to run continuously over every part, since the leaves are mere prolongations of the stem-forming portion, and because this venation is most convenient for long, narrow leaves. Of dicotyledonous leaves the opposites are true. The central type of leaf among monocotyls is long, narrow and rather fleshy; among dicotyls, simple, ovate and nearly ribless, or with faint digitate venation. Pinnate venation replaced palmate whenever circumstances caused leaves to lengthen faster than they broadened, the main ribs then being given off, not from the same point, but a little in front of one another. Pinnate ribs seem especially adapted to forest trees, probably protecting them against storms. The shapes of leaves thus depend upon two factors: first, the ancestrally inherited peculiarities of type and venation; second, the actual conditions to which the species is habitually exposed.

IV. *Special Types*.—Sessile leaves are particularly apt to be lanceolate. Decurrent leaves show the traces of the primitive unity of stem and leaf. Radical leaves, with long foot-stalks, will commonly be orbicular cordate and are most frequently produced from perennials with richly-stored root-stocks. The shapes of the leaves of climbers and trees have reference only to exposure to sunlight. Unequal exposure causes them to become oblique, e. g., *Begonia* and *Tilia*. Growth in dry soil and proximity to the sea, whether the plant grow in sand or mud, both tend to produce succulence. C. R. B.

EDITORIAL NOTES.

THE REPORT OF THE BOTANICAL SECTION of the Acad. Nat. Sci., Philad., for 1882, makes a good showing for the Herbarium, no less than 3,346 species having been added, one-third of which were new to the collection, and 100 of the genera not before represented. This is the largest annual addition since the organization of the Section, and is chiefly due to the zeal and liberality of Messrs. Redfield, Canby, Parker, Martindale, Meehan and others. Dr. Gray supplied more than 1,000 species, and Prof. Sargent furnished choice herbarium specimens of some of our rarer trees and shrubs. All this has thrown much labor on the Conservator, Mr. John H. Redfield, who has been ably assisted by the Philadelphia botanists above mentioned.

PROF. C. E. BESSEY, in the May *Naturalist*, very sensibly calls the attention of the Department of Agriculture to the subject of the parasitic fungi. Much money has been wisely expended by the government in the investigation of noxious insects, while no such provision has been made for the study of parasitic fungi, from the ravages of which there is an annual loss to our crops of millions of dollars. The rust, the smuts, and their allies ought to be thoroughly studied, and the government could do no wiser thing than to supply the Department of Agriculture with the means for carrying on such investigations.

IT SEEMS AS IF we we will have to give up the old idea that the growing point of phanerogams is a group of cells, as opposed to cryptogams with apical cell, for Dingler announces the discovery of an apical cell in the stems of seedling gymnosperms. And so phanerogams and cryptogams are gradually blending together, and paleontology and the microscope have caused to vanish our once "hard and fast line."

THE JOURNAL OF BOTANY for April contains a list of the new genera and species of phanerogams published in periodicals in Britain in 1882. The list is a formidable one, containing 16 new genera and 357 species, mostly from Asia, South America and Madagascar. This surely indicates wonderful activity, both in the field and in the herbarium.

THE STARCH GRAINS of seeds, especially of the bean and pea in which they are quite large, are almost always cracked by the loss of water in drying, the cracks radiating from the nucleus, because the interior layers contain proportionally more water. That the above statements are true may be easily demonstrated experimentally in the following way: Dry some fresh potato starch (which previous examination has shown to be sound) over a water-bath at a temperature of about 60° C. On re-examining the grains they will be found cracked radially. By treatment with absolute alcohol the process of cracking may be watched. Scrape the surface of a fresh-cut potato and dry the scrapings on blotting paper. Transfer to a slide and cover with 100 p.c. alcohol. In a few minutes the fissuring will begin, the first one always transverse to the long axis of the grain, or at right angles to the line of greatest contraction.

THE ROYAL GARDENS, at Kew, England, through the wise management of their officers and the liberal financial support which they receive, have become the center for the botanical and horticultural interests of the British Empire. The Report for 1881 shows something of the large amount of very varied and useful work which was carried on in and through them during that year. The Report contains reports from the Colonies and accounts of the progress of experiments in the culture of important economical plants, such as India rubber, Cinchona and Coffee.

WHAT HAVE BEEN called, by a stretching of the term, non-calcareous cystoliths, have been detected by H. Molisch in the pith of *Goldfussia isophylla*, *G. glomerata* and *Ruellia ochroleuca*. They occupy the interior of polyhedral or cylindrical sclerenchymatous cells which are scattered among the parenchyma. These "cystoliths" resemble the normal ones in the same plant in form, but

differ from all previously described ones in being attached to the cell-wall by several pedicels and in the absence of calcium carbonate. Their reactions indicate that they are composed of slightly lignified cellulose.

F. LUDWIG calls attention in *Kosmos* to the flower of one of the Aroideæ (*Philodendron bipinnatifidum*), whose structure is such as to fit it for fertilization by snails, which, attracted by a strong nutmeg odor, creep into the spathe and crawl about over the flowers. The snail is certainly the last animal to be suspected of any connection with the cross-fertilization of flowers. What next?

THE MEETING of the American Association of Science at Minneapolis next August will give an admirable opportunity for botanists to become acquainted with an interesting flora. Probably the first plant to attract attention upon arriving in the city is the northern wormwood, *Artemisia frigida*, with delicate whitened foliage clothing the rocks and banks below the Falls of St. Anthony. The other flowering plants meriting attention are numerous. The region is also rich in *Characeæ* and other fresh-water algæ, especially *Nostocaceæ* and *Desmideæ*. The long excursions will doubtless go into districts of still more unfamiliar vegetation. The meeting should command a larger attendance of botanical students and collectors than heretofore.

THE THEORIES in regard to the structure and growth of the cell-wall are having a thorough overhauling at the hands of German histologists. A *résumé* of Prof. Strasburger's last work, in which he criticises the generally-received Nægelian hypothesis, has already been given (vide, p. 172, this volume). In addition, now comes F. Schmitz, who adduces further arguments from the structure of the cell-wall in the filamentous algæ, in support of his view that the growth of the cell-wall in surface as well as in thickness is due to apposition and not to intussusception. Von Höhnel, after examining the wall of bast-fibers and other cells, comes to the conclusion that the wall is not composed of crystalline micellæ. All the phenomena exhibited by cell-walls with polarized light he believes can be explained by a simpler theory, and one which also explains some phenomena of swelling up of the wall not hitherto explicable on the micellar hypothesis. (See *Bot. Zeit.* XL, pp. 595 and 616, for an account of his theory of molecular tensions.) While the discussion is thus running it will be well for teachers and lecturers to hold lightly to the Nægelian theory of micellæ at least, and possibly also to that of intussusceptive growth.

IT SEEMS that the effect of free oxygen upon quiescent bacteria is so great that the presence of the trillionth of a milligram of the gas can be detected by their movements; and this fact is being applied in the study of the work of assimilation in relation to various colors, one result of which is to show that there must be a series of colors other than that of chlorophyll which possess the power of assimilation.

IT IS NOT CONSIDERED good taste to apologize for one's own appearance, but the April GAZETTE must be our excuse. We are to be congratulated that it made its appearance in any shape, for it fell into most incompetent hands. Having now contracted with a firm conceded to do the best work in the State, it is

expected that hereafter there will be nothing to offend the eye of the most fastidious.

PROF. J. E. TODD, of Beloit, Wis., observes that in *Psoralea argophylla* a joint is formed in the stem very near the top of the ground, as perfect as that separating a leaf from the stem. "It cuts through all the tissues so that when the top dries up and begins to sway in the wind, it is broken off very readily or evenly." Thus they are rolled across the prairie and their seeds are disseminated.

MR. THOS. H. CORRY has been studying the development and mode of fertilization of the flowers of *Asclepias Cornuti* and has made some important additions to the work done by R. Brown, Payer, Schacht, and others. He shows that the so-called "stigma-disk" is formed by the fusion of the two style-apices, and not by that of the two stigmas. The anther wings, he finds, originate as lateral processes of the connective. In the matter of pollen formation the genus presents a "perfectly unique, isolated, and peculiar case of formation." These and many other results were announced recently to the Linnean Society of London.

MR. J. G. BAKER has presented to the Linnean Society of London the second part of his "Contributions to the Flora of Madagascar," in which are descriptions of 160 new *Gamopetalæ*. A new genus is described allied to *Cinchona*. Several new genera of *Acanthaceæ* are described, among which is *Monachochlamys*, so named because each one of the numerous flowers is contained in a persistent spathaceous bract, like the hood of a Franciscan monk.

THE SHORT PAPER by Dr. A. L. Childs in the *Popular Science Monthly* for December, 1882, (vide BOT. GAZ., this volume, page 163), has called out a vigorous rejoinder from Mr. J. B. Strawn, C. E. Mr. Strawn, referring to the well-known fact that surveyors were in the habit of "blazing" trees on lines and at corners, says that, having had occasion many times to chop into such trees to satisfy himself of their identity, he has in every instance found the number of rings to correspond with the number of years which had elapsed since the blazing was done. The rings found by Dr. Childs he suspects to be those formed by trees when, from drought or some similar cause, the wood ceases to grow, but afterward, on account of copious rains and a high temperature, is forced into a second growth. Mr. Strawn also affirms that examination of trees of his own planting confirms him in the belief that the truthfulness of the "ring-record" may be depended upon.

CURRENT LITERATURE.

The Mycologic Flora of the Miami Valley, Ohio. By A. P. Morgan. From Jour. Cin. Soc. Nat. Hist. vol. vi., April, 1883.

Mr. Morgan has long been studying Fungi, and the above is a part of the result of his study in the Miami Valley. It is a most commendable effort to put the descriptions of these low forms of plant life within the reach of the many,

for it would be hard to accumulate too much knowledge of the so-called Fungi. The pamphlet before us is devoted to the *Leucospori* under the immense genus *Agaricus*, and the species number just 80. Four good plates illustrate six new species, all of Mr. Morgan's describing except the *A. Morgani* of Mr. Peck. The species are arranged according to the *Hymenomycetes Europæi* of Elias Fries, whose classical descriptions are also carefully translated, the local variations and general observations being appended in the form of remarks, which are very interesting. Lea's catalogue is the only other one covering this region, and his 34 *Leucospori* have been increased to 80 by Mr. Morgan, 5 of which he has described as new species, and 12 bear Mr. Peck's name as author. The second paper will be devoted to the remaining *Agarici*.

Tables for the use of Students and Beginners in Vegetable Histology. By D. P. Penhallow, B. S. Boston. S. E. Cassino. 1882.

This little book of some 40 pages is printed and bound in a most elaborate way, the large type, broad pages, and stiff back, fitting it more for the library than the laboratory. It is hardly fairly named, as it deals only with the micro-chemistry of plants, and by no means presents the broad principles of vegetable histology. It could be made useful under an efficient teacher, but then it would hardly be needed; but for an unskilled teacher, or one who is attempting self-instruction, it seems hardly the thing. There is given a list of reagents, but with nothing practical as to their preparation or application. Then follows an account of the common "vegetable products," under which, among others, we find grouped protoplasm, the nucleus, and silica. A better heading would have been "cell-contents," which is used for Table I. The second table is devoted to "Cellulose Forms," by which is meant the form and structure of cells; and Table III. is headed "Plant Products," which by no means includes all the "vegetable products" mentioned in the text under that caption. In fact, to the casual reader, it would seem rather difficult to draw the line between "cell-contents" and "plant products," although a table is devoted to each. The conception of the work is excellent, but the execution seems very imperfect.

ARTICLES IN JOURNALS.

ALLEN, GRANT.—From Buttercup to Monk's Hood (reprint from *Knowledge*), *Pop. Sci. Mo.* 23. 65; Shapes of Leaves, *Nature*, 27. 439, 464, 492, 511.

BAKER, J. G.—A Synopsis of the Genus Selaginella, continued (containing descriptions of 10 new species, all from S. Am.), *Jour. Bot.* 21. 97.

COOKE, M. C.—On Sphærella and its allies, continued (13 new species, 10 of which are from Georgia and S. Carolina), *Jour. Bot.* 21. 106.

DAVENPORT, GEO. E.—Some Comparative Tables Showing the Distribution of Ferns in the U. S. of Am., *Am. Phil. Soc.* Feb. 2. 1883.

DYER, W. T. T.—Review of DeCandolle's "Origine des Plantes cultivées" and Vilmorin-Andrieux & Co.'s "Les Plantes potagères," *Nature*, 27. 429.

GARDINER, J. S.—Fossil Algæ, *Nature*, 27. 514.

GROVE, W. B.—Notes on the Schizomycetes, V, *Sci. Gossip*, No. 220. 83.

HANCE, H. F.—A new Polygonum (from China), *Jour. Bot.* 21. 100.

HEMSLEY, W. B.—Two new Bermudan Plants (Erigeron and Statice), *Jour. Bot.* 21. 104; The Botany of the "Challenger" Expedition, *Nature*, 27. 462.

LAMB, HENRY.—Sketch of John Ray, *Sci. Gossip*, No. 220. 82.

MCNAB, W. R.—Pringsheim's Botanical Year-Books (review of vol. 12, part 4, and vol. 13, part 3), *Nature*, 27. 502.

MORGAN, A. P.—The Mycologic Flora of the Miami Valley, Ohio (Leucospori), *Jour. Cin. Soc. Nat. Hist.* 6. 54.

ROTHROCK, J. T.—Some Microscopic Distinctions between Good and Bad Timber of the Same Species (with plate), *Am. Phil. Soc.* Feb. 2, 1883. 599.

ZABRISKIE, J. L.—Dispersion of Seed by Wistaria, *Am. Nat.* 17. 541.

BOTANICAL GAZETTE.

VOL. VIII. JUNE, 1883. No. 6.

Some North American Botanists.

VI. DR. WILLIAM BALDWIN.

In the southeastern corner of Pennsylvania, just north of the famed Mason and Dixon line, lies the county of Chester, picturesque, historic and fertile, but specially prolific for a century past in cultivators of botanical science. Within its original limits were born the Bartrams, father and son, and within its present limits were born Humphrey Marshall, Dr. William Darlington and his coadjutors David Townsend and Josiah Hoopes, not to mention the Jacksons, father and son, nor the brothers Pierce, who, perhaps, were cultivators rather than botanists.[1]

And in the township of Newlin, in this same county, on the 29th of March, 1779, was born William Baldwin, the subject of this sketch. His father, Thomas Baldwin, was a member and an approved minister of the society of "Friends." He gave to the son such rudimentary education as the common schools of the vicinity could furnish. But the youth thirsted for knowledge, and soon became a teacher, daily acquiring for himself and imparting to others such store of information as was at his command While thus engaged his thoughts were turned to the medical profession, and he became the pupil of Dr. William A.

[1] John Bartram was born at Darby March 23, 1699, and died in 1777. His son William was born at the same place Feb. 9, 1739, and died in 1823. Humphrey Marshall was born at West Bradford Oct. 10, 1722, and died in 1801. John Jackson was born at London Grove Nov. 9, 1748, and died Dec. 20, 1821. William Darlington was born at Dilworthstown April 28, 1782, and died at West Chester April 23, 1863. David Townsend (for whom *Townsendia* was named) was born in Pughtown Dec. 13, 1787, and died in West Chester Dec. 6, 1858. Joshua Hoopes was born in Westtown Feb. 12, 1788, and died at West Chester May 11, 1874. William Jackson, son of John, was born at London Grove Nov. 7, 1789, and died there Oct. 29, 1864. Most of these dates were kindly communicated by Josiah Hoopes, Esq., himself a Chester county botanist.

Todd, of Downingtown, in the same county; and afterwards, in the winter of 1802-3, attended his first course of medical lectures at the University of Pennsylvania. Here he formed the acquaintance and secured the intimate friendship of Dr. William Darlington, who, while suffering from a severe attack of illness, received from young Baldwin assiduous kindness and attention, which he never forgot. After his first course of lectures at Philadelphia he resumed his studies with Dr. Todd, at Downing town; and here he became acquainted with Dr. Moses Marshall, nephew of Humphrey Marshall, the well-known author of "*Arbustum Americanum*," and founder of a botanic garden at Marshallton. The nephew had also some botanical knowledge, and had been of material service to the uncle, both in the establishment of his garden and in the preparation of his work on American Forest Trees and Shrubs. Dr. Marshall seems to have first awakened Baldwin's taste for the study of the vegetable creation; and the rich collection of indigenous plants in the Marshallton garden served to strengthen this taste, which soon deepened into zeal under the instruction of Dr. Benj. Smith Barton, of Philadelphia.

In 1805 Baldwin received the appointment of surgeon on a merchant ship bound to Canton. Returning from China in 1806, he resumed the medical course at the University of Pennsylvania, and on the 10th of April, 1807, he received the degree of M. D. He selected Wilmington, Del., for the practice of his profession,[1] and soon afterward was married to Miss Hannah M. Webster, of that city, a lady of superior intellectual endowments, and favored with a finished classical education, unusual for that day. At Wilmington he devoted his leisure to the study of the plants of that vicinity, and while there, in 1811, he attracted the attention of Dr. Muhlenberg, of Lancaster, who sought a correspondence with him, which was actively maintained until Muhlenberg's death in 1815. Dr. Darlington has given this correspondence to the world, and the letters on both sides, ninety in all, are characteristic of the respective writers, and illustrative of the formative period of American botany. Botanical students of the present day, supplied with text-books and Floras of the most perfect kind, can hardly realize the difficulties of those early stu-

[1]Dr. Baldwin joined the Delaware State Medical Society May 4, 1811, the same year and time at which Dr. Gibbons became a member. Dr. Gibbons was long the Nestor of the medical profession in Wilmington, and was the father of Charles Gibbons, of Philadelphia, and of the Gibbons (brothers) of California, who have been of service to botany there.—*Minutes of Delaware State Medical Society, per Dr. Bush.*

dents, forced, as they were, to grope in the dark for differences between old and new, and perplexed by the conflicting synonymy and imperfect descriptions of the few books then accessible.

Pulmonary weakness forced Dr. Baldwin, in the autumn of 1811, to resort to a milder climate, and he removed to the State of Georgia, residing chiefly at Savannah and St. Mary's Here was a new and interesting field for botanical research, which he cultivated with great ardor, making long journeys on foot, with knapsack on his back, often entirely alone, penetrating far into the territory of the aborigines, among whom his peaceful principles and gentle bearing secured him a kind reception. In 1812 war with Great Britain interrupted these pursuits and called into use his professional abilities as surgeon of a gunboat flotilla stationed at St. Mary's. For two years he ministered to the sick and distressed with no other aid than that of his wife. After the close of the war he was stationed at Savannah, where he was brought into close and friendly communication with Stephen Elliott, author of the "Sketch of the Botany of South Carolina and Georgia." His correspondence during these years of Southern residence shows that, notwithstanding the interruptions caused by professional labor, and by war's rude alarms, he lost no opportunity for botanical research and for the acquisition of new material.

Near the close of the year 1817, he received an appointment as surgeon of the U. S. frigate Congress, which was to visit Buenos Ayres and other South American ports. His knowledge of natural history led to this appointment, and it was accepted with the hope that his failing health might be restored. His ship touched at Rio Janeiro, Montevideo, Buenos Ayres, Maldonado, San Salvador and Margarita. At all these places he made diligent use of his limited opportunities for collecting, and in the Philadelphia Academy are preserved many of the plants so collected.

From this voyage he returned in July, 1818, rejoining his famly at Wilmington. He now bent all his energies to the study of the material collected during his Southern residence, with a view to publication, under the proposed title of "Miscellaneous Sketches of Georgia and East Florida, to which will be added a descriptive catalogue of new plants, with notices of the works of Pursh, Elliott and Nuttall, to which will be added an appendix containing some account of the vegetable productions on the Rio de la Plata, etc." In September he writes Darlington: "I have to inform you that I go on *slowly*, and, I hope, the more surely. It will not do to hurry—there has been too much hurrying among our

botanists. But you may rely upon it, that nothing but death or disease will prevent me from going on steadily. Both interest and knowledge increase as I get along." The Southern *Cyperaceæ* now especially engaged his attention. His letters to Darlington and Collins, at this time, are full of critical notes and minute inquiries relative to the species of *Cyperus*, *Scirpus* and *Rhynchospora*, and he had nearly completed his elaboration of the plants of this order, and was engaged upon the genera *Paspalum* and *Panicum* among the grasses, when he reluctantly laid aside his work at a new and unexpected call. The government was preparing to send out a new expedition for the exploration of the upper Missouri, under the command of Major Long, to be accompanied by a corps of naturalists. Baldwin's friends, Darlington and Leconte, successfully urged his appointment as botanist, and prevailed upon him to accept. Hope of prolonging his failing health doubtless influenced his decision. In March, 1819, he made the journey over the mountains to Pittsburgh, where he joined his fellow-travelers. A small light-draft steamboat had been constructed for the long river voyage; but repeated delays ensued, and it was not till the 5th of May that the departure took place. From the beginning Baldwin seems to have had sad foreboding. On the point of departure he wrote Darlington: "I shall hold out as long as I can. Whether my remains are deposited on the banks of the Missouri or among my kindred at home, is now a matter of little consequence. For the sake of my family and the pursuits I am engaged in, I should wish to live a few years longer." In fact his strength was already failing, and only his enthusiasm and force of will sustained him. The boat proved unsuitable for her work, was leaky, damp and uncomfortable, requiring constant repairs. A stop was made at Cincinnati for a week, partly for repairs and partly on account of the alarming condition of Dr. Baldwin, who remained on shore with his friend Dr. Drake, until he rallied. As the boat made her slow way down the Ohio and up the Mississippi and Missouri, he chafed under the restrictions, both of military rule and of increasing weakness, and in his desire to make the most of the few opportunities allowed him for collecting, he doubtless exhausted his little remaining strength.

The following almost last words written on the 7th of July, have a sad interest: "The mortification and chagrin which I feel in being thus disappointed from time to time in my expectations of doing anything worthy of notice in this expedition, are inexpressible. Perhaps I do not support myself under it as I ought,

and may manifest a disposition too irritable; but when I reflect upon the period of life to which I have attained, the delicate state of health to which I am reduced, without the means of doing anything efficient (I fear) to restore it, the unfinished labors of eight years, which would be almost entirely lost in case of my decease; and, above all, the rising family which look to me for support, I can not but feel anxious." * * * On the 15th of July the expedition reached Franklin, Mo., and here Dr. B. was compelled to leave it. He found a hospitable home at the house of John J. Lowry, and there, September 1st, he died, in his 41st year. He left a wife and four children, the youngest then an infant. The friend who knew him best, says of him: "I have never yet had the happiness to be acquainted with any man of a more amiable and upright character, more faithful in the discharge of his duties, or more zealously devoted to the interests of science and the welfare of his fellow creatures."

Dr. Baldwin's published scientific papers were but two, and these were offered for publication just before starting on his last journey. They are:

1. An account of two North American species of *Rottbœllia*, discovered on the seacoast of Georgia. *Am. Jour. Sci. 1st series, I., 355. 1819.*

2. An account of two North American species of *Cyperus*, from Georgia, and of four species of *Kyllingia*, from the Brazilian coast and from the Rio de la Plata. *Trans. Am. Phil. Soc. Phila. New series, II., 167. Read Apr. 16, 1819.*

Fortunately his unpublished memoranda fell into the hands of Dr. Torrey, and though in a crude and fragmentary state, they were used as their author would have wished, as contributions for Dr. Torrey's Monograph of the *Cyperaceæ*, and for Dr. Gray's Monograph of *Rhynchospora* in *Annals of N. Y. Lyceum of Nat. Hist. Vol. III.* His herbarium was purchased by his friend Collins, from whom it went to Schweinitz, who bequeathed it to the Phil. Ac. Nat. Sci.

In preparing this sketch free use has been made of the Memoir prefixed by Dr. Darlington to the "*Reliquiæ Baldwinianæ*," and of the valuable correspondence there found. Other material consulted has been a series of letters from Baldwin to Zaccheus Collins, twenty-one in number, covering the last two years of Baldwin's life, contained in the "Collins Correspondence" in the library of the Philadelphia Academy, and a copy in Collins' hand of the botanical notes made by Baldwin on his last sad journey. See, also, Vol. I. of James' History of Major Long's Expedition, Philadelphia, 1823.

J. H. REDFIELD.

Aster or Solidago?

In September last I found some rather anomalous specimens of a plant in the prairie near my house. Englewood, like other suburbs of Chicago and many western towns, has its houses scattered over the prairie, with interspersed patches of grass land as virgin as when the buffalo and Indian roamed over it. Such a piece of ground lies between my house and the school house where a part of each school day is spent. Hence, this vacant lot is passed several times a day on the way to school, or market, or postoffice, and any change of floral appearance quickly noticed. It is often the scene of a raid for specimens of any particular plant known to grow there when needed to illustrate a lesson in botany. Something of a specialty is made of the study of the *Compositæ* in the fall, and few escape the search of pupils and teacher for class work. For the past five years this has been the case, and I thought about every inch of that acre of ground was known. But, greatly to my surprise, there appeared, close to the side-walk, a plant I had never seen before. Was it a Golden-rod or Aster? But who ever heard of an Aster with yellow rays? was the second thought, on pulling up the specimen. Taking it to my room and examining it, it was seen to be unique, and not much time elapsed before the vacant lot was thoroughly searched and more specimens found. About all were single stalks, except one, in which more than a dozen stems sprang from the same root. They were about a foot high. All the stems from this root did not bear yellow-rayed flowers; some were white, some ochroleucous, some pale or sulphur yellow. It was evident that the habit of the plant was that of *Aster ptarmicoides*, Torr. and Gr., plenty of which, both single and many stalked, grew in the vicinity. But the flowers were considerably smaller than those of any *Aster ptarmicoides* observed, as proved by comparison, being about half an inch in diameter. The plant was smoother, and the leaves tapered below into a clasping petiole, or one tending to clasp, on some of the stems. In this it suggested *Solidago Riddellii*, Frank, growing close at hand. Could it be a hybrid, a cross between this *Aster* and *Solidago*, or some other *Solidago?* was the next query. Will genera cross? This led to the preservation of the plant. It was not dug up, but left to fruit, except a little cut off to get a variety of the flowers. A stake was driven beside it so that it might be identified when the flowers had faded, and all the heads gathered as

they ripened. I wished to see if it could be propagated. But most of the achenia are withered—apparently blasted. Some heads, however, show from one to three achenia that are plump and look as if they might grow. Heads of *A. ptarmicoides* and *S. Riddellii* gathered at the same time are found to have generally perfected their fruit. On comparing the fruit with that of *A. ptarmicoides* it is seen to be quite identical, smooth, light-colored and of the same size. That of *S. Riddellii* is slightly roughened under a lens, and is characteristically marked by five to seven dark-colored longitudinal stripes. Some of the achenia of the anomalous plant seem a little striped, but very faintly, so that it can hardly be relied on for a character. The involucre is smaller and more cylindrical than in *A. ptarmicoides.* The scales are about the same as in that species.

The plant has been left where it grew, so that it may be noticed another season, and its behavior observed. The interest of the plant to me is whether *Aster* and *Solidago* will cross, especially in the wild state, and should the cross be permanent and capable of propagation by seed, what bearing it may have on the origin of species. It can not indeed be proved that it is a hybrid, but this seems the best explanation now available. Had all the flowers been yellow, or even ochroleucous, it might seem a pure example of one or the other genus, but with flowers of three colors from the same root, and other intermediate characters, it is hard to regard it as such. The flowers, in color and size, are a mean between *A. ptarmicoides* and the Solidagos,others, besides *S. Riddellii,* being near neighbors, as *S. nemoralis, S. lanceolata.* It should be added in passing that the prairie here was originally wet, but the opening of streets and railroads with accompanying ditches and sewers, has drained it so as to produce a promiscuous mingling of wet land and dry land floras,as far as they are able to accommodate themselves to the change, and hence queer floral neighbors are found.

It is possible this plant may throw some light on the *Aster lutescens* of Torrey and Gray's Flora of North America, gathered by Douglas and assigned the habitat: "Saskatchewan, dry elevated grounds of the Assiniboin River." It is stated that Douglas had labeled his specimens "flowers yellow," but that the rays appeared to have been at most ochroleucous. "If this be the case," the authors add, "it is doubtless a distinct species, if not, it may prove to be only a variety of *A. ptarmicoides,* as Hooker supposes."—E. J. HILL, *Englewood, Ill.*

Morphological Notes.

1. *Juglans cinerea* and *J. nigra* are both possessed of winter buds composed of entire transformed leaves. The buds under consideration are the terminal buds. The scales in the former species (Fig. 1) are somewhat tapering, although thick and broad throughout their entire length. Those of the latter (Fig. 2) are broad at either end, but contracted at the center. In both cases a series of narrow grooves, running parallel from the raised ridge in the middle to the edges on either side, indicate the leaflets of our transformed leaf. This portion, however, is confined to the tip; hence the greater part of these scales must be composed of the *common petiole* of a compound leaf.

x 1½
Fig. I

X 2
Fig. II

2. The same structure is visible in *Fraxinus quadrangulata*, Mx. In this case the buds are not long, as are those of *Juglans*, but short and conical. The outer scales (Fig. 3) show the same ribbed structure, indicating leaves. In this case we again have scales composed chiefly of the common petioles of compound leaves, but the leaflets still remain attached in a rudimentary condition, as in the case of *Juglans*.

Fig. III

3. In *Negundo aceroides* the scales (Fig. 4, a) are of an ovoid shape, and bear at the tip three small leaflets, which, however, shrivel up and fall off in winter, leaving a scar on each scale at the tip (Fig. 4, b). In this plant, therefore, the scales consist only of the remaining common petiole of a compound leaf. In other members of the genus *Fraxinus*, where indications of leaflets never appear, the scales may be considered as composed only of the common petiole, the leaflet being obsolete.

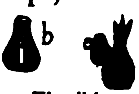


Fig. IV

4. *Sassafras officinale* has scales bearing such plain veins that we may confidently attribute their origin to the blades of leaves.

5. In *Smilax hispida* the petioles remain during winter half surrounding the bud and acting as one of the outer scales of the hibernaculum (Fig. 5). The tendrils, which are transformed stipules, also remain, being attached to the petiole. The remaining scales composing the proper envelopes of the hibernaculum, in this case, may be considered the bases of petioles, much changed in their new capacity..

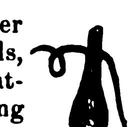


Fig. V

6. The thorns of *Robinia* are known to be stipules; those of *Gleditschia*, branches; those of some *Astragali*, petioles; those of the Barberry the veins of the leaves. (See Gray Struct. Bot.)

7. A study of the Osage orange, *Maclura aurantiaca*, shows its thorns to be transformed branches. Tiny notches toward the tip often indicate nodes on this branch. At the base, on either side, are two scales, only one of which subtends a bud, the other being empty. These are at the two lower nodes of the metamorphosed branch. On growth of the young bud into a branch it pushes the thorn aside, so that this appears to be axillary to the young branch in the axis of the really empty scale at its side.

8. The spines of *Ribes Cynosbati* are mere outgrowths of the bark, as are also those of the *Smilax* above mentioned, and therefore are of no morphological importance.

9. In *Sambucus Canadensis* the buds consist of short but broad scales which already subtend several axillary buds, as well as aid in protecting the large central bud which is to furnish the main shoot. A single bud, however, which sometimes appears beneath the central bud, seems to have no connection with it, and I can not find that it is subtended by a scale. It however originates in the same tissues with the larger bud, and the connection with it may be traced beneath the bark. Can they, in such cases, be strictly said to be superposed?

10. In *Lindera Benzoin* two branches, superposed in the axils of last year's leaves, each terminate in a leaf bud and have two lateral branches which are flower buds. In spring the lateral buds blossom, and the terminal buds are at liberty to develop into branches, but the upper one generally gets the start, and the other dies. In this way we have extra-axillary branches.

11. The development of the bud scales of the dogwoods in spring is quite interesting. In *Cornus florida* each scale represents the *tip of a leaf*, and in spring it shows its character by developing at the base into a broad petaloid blade, which bears the withered scale at its tip. In this condition the scales serve as an involucre to the condensed cyme (glomerule) within. The closely related *C. Canadensis* has a similar involucre, which, however, never served as scales, being enclosed with the leaves in a subterranean hibernaculum, and having developed from it on the approach of spring. In this it resembles many other herbaceous perennials. The scales which compose the hibernaculum are almost membranaceous, and represent the *entire blades* of leaves. As far as can be observed from a few specimens, the growth of the stem from year to year is sympodial. First a terminal bud

develops into a flowering stem; after flowering this dies, but at its base two opposite buds have been formed, only one of which develops the following season, and this manner of growth is continued from season to season.

12. In *Viburnum nudum* the bud scales are composed of the bases of leaves, their morphological nature becoming evident by the development of leafy tips or blades in spring. (Fig. 6, outer scale; fig. 7, inner scale.) These leafy tips are formed on the scales of both leaf and mixed buds, but owing to the falling off of the more evident broader scales early in the spring while their blades are still quite small, and their consequent non-preservation in herbaria, the fact is generally overlooked. The development of the base here before the tip of the leaf forms an exception to the usual rule that the development of leaves proceeds from their tips to the base.—AUG. F. FOERSTE, *Dayton, Ohio.*

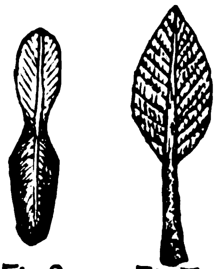


Fig. 6 Fig. 7

Teratological Notes.

1. *A Botrychium with three fertile segments*.—Among the numerous specimens of *B. Lunaria*, Swartz, sent by Mr. S. M. Turner from Afognak Island, Alaska, there is one that has two secondary fertile segments standing on the main fertile segment of the frond. They start from it near its commencement, and are all nearly the same size. All appear fully developed, bearing about the usual number of sporangia.

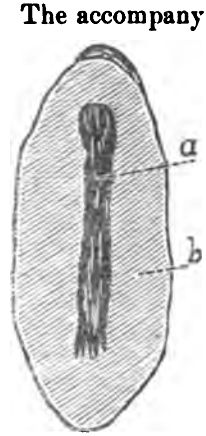
2. *Ludwigia alternifolia with a broad stem*.—During the past August I found a specimen of this species in which the upper half of the stem was only about one eighth of an inch thick, while in breadth it measured from one-half to an inch. It sent out, at the sides, short flower bearing branches. The plant grew in a swamp, was nearly four feet high, and otherwise thrifty.

3. *Ranunculus repens with flat peduncles.*—During the past summer I found several examples of this species in which the peduncle was flat, and bearing on its top an irregular mass of petals.

4. *Two Oaks grown together.*—Within three miles of Mt. Carmel (Ill.) there is an Oak (*Q. palustris*, Du Roi), which commences with two roots; these are so close together and intergrown as to appear as one at the surface of the ground. The

two bodies, however, start separately and are several inches apart for nearly ten feet, when they unite and form a single straight trunk, making, in all a tree nearly seventy feet high. The two trunks, where they are separate, are about six inches in diameter, round, straight, and appear to be solid and perfect.

5. *Blighted Hickory-nuts* —During the winter of 1881-2, I found a number of what I take to be blighted hickory-nuts. Besides those that I found several were brought to me as matters of curiosity, and all were similarly deformed. The accompanying sketch will probably help to convey the best idea of them. The central part (a) is hard and solid and is imbeded in a cavity which is just large enough to contain it. It is everywhere free, except at the lower end, from which it appears to have grown I take it to be the kernel lignified. The endocarp (b) is thicker than usual, solid, and very hard. The nut appears to be the proper length, but too slender. All the examples I saw I took to be fruit of *C. sulcata.* While I have cracked a goodly number of hickorynuts every winter for nearly thirty years, this was the only season in which I noticed this deformity. May it not be that the long drought during the previous summer, which continued from the last weeks in June to the first of September, was the cause of this growth?



6. *A Butternut imbedded in the solid wood of an ash tree.*— While waiting in the office of my friend, Dr. A. J. McIntosh, I was shown a piece of ash wood in which was firmly imbedded a veritable butternut. The wood that had formed around it appeared to be healthy and firm when cut. The exocarp was gone, but the wood in its growth had fitted itself into the interstices of the endocarp. The Doctor, who is a Jacksonian Democrat, explains it in this wise: During war times one of the "butternuts" was so closely pursued by a " home guard " that he took the first hole he could find, and this happened to be a wood-pecker's hole in an ash tree.

7 *Double Tulips* —Several years since I was invited by a lady friend to call and see some double tulips. Before starting, I stated that I did not think they could be doubled more than one and one-half times, thinking that the six stamens and three pistils had been developed into petal-like organs. But to my surprise I found the tulips as double as any rose. I was at a loss to

explain the condition, until after examining the scape, which I found to be leafy, especially at the top, and the upper leaves took on the shape and color of sepals and petals. I can not believe that this was a deformity, the result of an injury, as there were several plants in the same bed in the same condition. I would like to ask, is the conversion of leaves into petal-like organs a common method by which flowers are doubled?—J. SCHNECK, *Mt. Carmel, Ill.*

GENERAL NOTES.

Hibiscus Moscheutos and H. roseus.—Dr. J. Guillaud, of Bordeaux, sends a pamphlet containing his investigations resulting in the indentification of *Hibiscus roseus* of Thore,—a species supposed to be indigenous to the southeastern coast of France, also found in Italy,—with our marsh Hibiscus. He is not aware that the same identification has been made by Mr. Daydon Jackson, and published a year or two ago in the 19th volume of the *Journal of the Linnæan Society*, London. Dr. Guillaud has had the advantage of seeing the two plants growing spontaneously, ours in the neighborhood of New York, the other in the marshes of the Landes. *H. roseus* has also been found in Northern Italy, in the marshes of the Po and lagunes of the Adriatic; and, according to Dr. Guillaud, specimens have been received from Asia Minor, but no mention is made of it in Boissier's Flora Orientalis. Is this species indigenous to Europe as well as to the Atlantic coast of North America? Is it a survival from the time when the floras of Europe and of Eastern America had more common elements than they now have? Or has it somehow been conveyed across the Atlantic; and if so, whether at some early period or within historic times? Questions not easily answered. If the first, then this plant, like a few others that might be named, is in Europe what *Convallaria majalis, Littorella lacustris, Marsilea quadrifolia, Scolopendrium*, and perhaps *Calluna*, are in North America. In favor of the second view, and even of a late and casual introduction, it is to be said (as Dr. Guillaud notes) that Thore found the plant on the coast of France only at the beginning of this century; that it was unknown to Tournefort, who botanized around Bayonne in the autumn of 1688; that the plant has disappeared from the particular station where Thore found it and where it was said to abound; and that it is now more rare than formerly. Its spread from the Atlantic coast to that of the Adriatic, may be owing to the carriage of seeds by marsh-birds. Indeed, Dr. Guillaud thinks it may have been brought to Europe by sea-birds. On the other hand, since it is now found in the district near Mantua, he quotes the lines in Virgil's Eclogues in which the stems of *Hibiscus* are twice mentioned, in a way by no means *mal à propos*; but he thinks they might as well apply to Marsh-mallow.

It appears that the specific name *Moscheutos* came to Linnæus through Cornuti from a "Rosa Moscheutos" of Pliny, some kind of Rose-mallow, we may suppose. Since the two Linnæan species are clearly one, it is a pity that the

name *H. palustris* was not chosen. Torrey and Gray are responsible for that. The reason of the choice was, that *H. Moscheutos* stands first in the book, and *H. palustris* is merely differentiated from that; reasons which need not have prevailed. A. GRAY.

Stipules in Saxifragaceæ are of small account, as Prof. Coulter's pupils show, by sending *Mitella diphylla* with good stipules between the cauline leaves. It seems to be regularly so.—A. GRAY.

Notes on Æsculus glabra.—One of my botany class, Mr. J. W. Milligan, has been making some observations upon the flowers of this Buckeye which seem worth recording. It is well known that the flowers tend to be polygamous, not so much from the suppression of stamens or pistils, as that they fail to develop; at least this is the way the tendency manifests itself with us. All the perfect flowers furnish good examples of protogyny, while others at first sight seem protandrous, but this latter is seen to result from a failure of the pistil to develop. In fact the forms seem so various that one is at first at considerable loss how to "place" them. The flowers are apparently in a transition state and on the way to becoming monœcious. Mr. Milligan observed that the clusters were visited by numerous bees, principally the honey bee, but that they avoided the opened flowers, and only sought the well advanced buds. The petals so poorly protect the nectar that it is easily obtained by thrusting the proboscis between them. The question was at once suggested whether this could in some measure account for the numerous sterile pistils, which far outnumber the fertile ones. The open flowers were avoided and could only have been fertilized by the chance of being near the buds, for the bees had evidently learned that the latter contained the nectar. This would necessarily result in some sterile pistils, which might lead to polygamy in effect, if not in fact. But what would lead to a suppression of stamens and so make polygamy end in monœcism would be hard to say. At any rate, it is a case of an insect attracted by a flower which it does not visit but may accidentally fertilize, and obtaining nectar from a flower which it can neither fertilize nor obtain pollen from.—J. M. C.

Large Toxicodendron.—I have found at Dayton a specimen of *Rhus Toxicodendron* measuring, some distance above the base, 17 inches in circumference or about 5½ inches in diameter. Its first branch was 14½ inches in circumference. Another branch was 4 inches in diameter. The specimen is remarkable for its strong and vigorous growth, and twines upon an almost dead locust tree, clothing it with the foliage of the Poison Ivy. It is close to the city and is destined to become quite an attraction to our amateur botanists. —AUG. F. FOERSTE, *Dayton, O.*

Vincetoxicum.—Following some authority, which it is now not worth while to look up, it appears that in the Synoptical Flora of N. America, I had derived this name from "*vinceus*, that serves for binding," and *toxicum*. Dr. Hance, in *Britten's Journal of Botany* for May, 1883, notes, 1, that the only authority for this adjective is a line of Plautus in which *vincea* is now known to have been a mistake of some copyist for *juncea*. And, 2, that the old herbalists, Fuchs and Matthiolus, clearly indicate that the Latin part of this hybrid name is from *vincere*, to conquer.—A. GRAY.

Notes on Fresh Water Algæ.—To my note under this heading in the last GAZETTE I wish to add that it may be a question whether *Rivularia fluitans* should not be referred to *Echinella articulata*, Ag. That species is known to me only through the figure in English botany and the figure given by Phillips in *Grevillea*, Vol. IX., pl. 144, a-d. From the figure in Eng. Bot. not much information can be derived, but from that in *Grevillea*, which appears to be referred without hesitation to *Echinella articulata*, Ag., one can not fail to see a close resemblance to the alga collected by Prof. Arthur, with which it also agrees in its peculiar habitat.—W. G. FARLOW.

Chloranthy of Ranunculus Californicus.—Green Buttercups are unusually common about San Francisco Bay this season. The persistent floral organs (excepting the almost normal yellowish stamens) are as green as the ordinary foliage. The spoon-shaped sepals are not reflexed; the hairy petals have ovate blades only two lines long, borne on slender petioles three to six lines in length. The nectariferous scales are plainly seen at the bases of the blades. Most of the capellary leaves become stipitate empty akenes, but some are open on the inner side, and a few become oblanceolate leaves two or three lines in length.—VOLNEY RATTAN, *San Francisco, Cal.*

Discharging Ascospores.—In the January No. of the GAZETTE appeared an interesting account of the sound of discharging ascospores observed by Mr. E. W. Holway, Decorah, Iowa. I have this spring heard the same hissing sound on opening a box in which a number of *Peziza coccinea, Jacq.*, had been inclosed for two hours.

I transcribe an extract from a letter written by the distinguished botanist Haller, Gottingen, Sept. 19, 1740, to the father of botany, Linnæus, Upsal, Sweden: "The place where I am is but a barren field for botany excepting fungi, which are plentiful. I have detected a very curious elastic motion in the common sessile *Peziza*, of a dirty white hue. The whole plant contracts spontaneously and discharges a powder upwards with a sort of hissing sound. This doubtless is the seed." He furthermore says that "fungi are a mutable and treacherous tribe;" a fact just as apparent to-day as it was 143 years ago.—L. V. MORGAN, *Cincinnati, O.*

EDITORIAL NOTES.

SINCE THE NOTICE in the GAZETTE of the appearance of a supplement to Chapman's Flora, many inquiries have been made regarding it. A note from Dr. Chapman conveys the information that the new edition is now on sale with Ivison, Blakeman, Taylor & Co., N. Y., and Ashmead Bros., Jacksonville, Fla. The supplement is not sold separately, but is bound with the new edition.

MR. W. B. HEMSLEY, of the Kew Gardens, is preparing a work which will be practically a flora of the remote islets of the Atlantic and Southern Oceans. With regard to the Bermudas it may be that some of the readers of the GAZETTE may be able to give some help. The composition of the flora of the Bermudas

is found to contain more of the endemic element than was anticipated; and, among other things, it is suspected that there is at least one palm quite different from the continental American species. Good specimens of the native palm or palms would be very thankfully received at Kew, and any reader of this notice who will send such specimens will be doing a favor to botanists in general.

THE OTTAWA FIELD NATURALISTS' CLUB is an organization that it would be well for some of the brethren of the "States" to pattern after. It was established in 1879, and has now entered upon its fifth season of field work, the object being an exhaustive study of the natural history of Ottawa and vicinity. Transactions have already been published containing numerous lists. Excursions are made monthly, and leaders are appointed in each department who are looked to for information and assistance, and who have charge of the excursions of their department. The leaders in botany are R. B. Whyte and J. Fletcher for Phænogams, and Prof. J. Macoun for Cryptogams, Messrs. Whyte and Macoun being also the Vice-Presidents of the Club. Information as to the workings of the Club may be had by addressing the Secretary, W. H. Harrington.

AT THE LAST ANNUAL MEETING of the Syracuse Botanical Club the following officers were elected for the ensuing year: President, Mrs. Lillie Barnes; Vice-President, Mrs. Nellie Goodrich; Recording Secretary, Miss Mary Hotchkiss; Corresponding Secretary, Mrs. H. S. Gifford; Treasurer, Miss Hattie Leach.

DR. MASTERS has described before the Royal Horticultural Society a Malvaceous plant said to be a cross between *Hibiscus Rosa-sinensis* and *Abutilon striatum*, the former genus furnishing the pollen. The plant has the flower characters of *Abutilon*, but the truncated column and foliage of *Hibiscus*.

IN THE DESCRIPTION of *Phallus togatus*, Kalchbrenner, in the May GAZETTE, two errors are noted. In the measurements, "m. m." should be "μ"; and "parvio" should read "pervio."

MR. THOMAS MEEHAN has discovered sensitive stamens in *Echinocactus Whipplei*. This has long been known in our common *Opuntia*, but in this *Echinocactus* the motion is not so great, nor so immediate after the stimulus.

THE FOLLOWING SUMMARY by Mr. Bentham, taken from the *Jour. Bot.*, of the number of phanerogamic plants known to science is especially interesting now that the last volume of the *Genera Plantarum* has appeared:

	Orders.	*Genera.*	*Species.*
Polypetalæ	82	2,610	31,874
Gamopetalæ	45	2,619	34,556
Monochlamydeæ	36	801	11,784
Gymnospermæ	3	44	415
Monocotyledons	34	1,495	18,576
Totals	200	7,569	97,205

PROF. J. G. LEMMON has read before the California Academy of Sciences a very interesting paper upon his discovery of the potato in Arizona, noticed before in these pages. Professor Lemmon's supply of potatoes has been exhausted, but he is off again to the Huachuca Mountains this fall for a fresh supply, which various cultivators will experiment upon.

BARON FELIX THÜMEN has offered his rich Mycologic Herbarium for sale. In all it probably contains 20,000 species, from all parts of the world; many of them types, and most of them bearing the labels of the most distinguished mycologists of this country and Europe. The "Mycotheca Universalis" is to be continued. Baron Thümen can be addressed at Vienna, Währing, Schulgasse 1.

ARTICLES IN JOURNALS.

BAILEY, W. W.—Mosses, *Am. Nat.* 17. 608.
BAKER, J. G.—Two new Carices from Central Madagascar (with plate), *Jour. Bot.* 21. 129: Synopsis of the genus Selaginella, continued (2 new species). l. c. 21, 141.
CELAKOVSKY, DR. L.—Upon some species of the genus Thymus, *Flora*, Mar. 11, continued April 1.
COOKE, M. C.—On Sphærella and its allies, concluded (6 new species, 2 from U. S.), *Jour. Bot.* 21. 136.
DETMER, W.—Review of Adolph Mayer's paper "On the theory of chemical ferments," *Bot. Zeit.* April 6.
FISCHER, A.—On cell division in Closterium (with plate), *Bot. Zeit.* April 6.
GOODALE, GEO. L.—Color and Assimilation (a note upon Th. W. Engelmann's device for measuring the assimilative activity of vegetable cells by the effect of the liberated oxygen upon bacteria), *Science*, 1. 332: On the development of chlorophyll and color granules (remarks upon the recent papers of A. F. W. Schimper in Bot. Zeit.), l. c. 1. 421.
GRAY, ASA.—Notice of Engler's "Essay on the development of the vegetable kingdom, especially on the distribution of floras since the Tertiary period." *Am. Jour. Sci.* 3. 25. 394; with J. HAMMOND TRUMBULL, Review of De Candole's "Origin of cultivated plants," with annotations upon certain American species, Part II., l. c. 3. 25. 370.
GREENE, E. L.—New plants (5, chiefly from the Pacific coast), *Torr. Bull.* 10. 41.
HANCE, H. F.—A Chinese Clethra, *Jour. Bot.* 21. 130.
HEMSLEY, W. B.—On the relations of the fig and the caprifig, *Nature*, 27. 584: A new Afghan plant (a Tanacetum), *Jour. Bot.* 21. 135.
HOFFMANN, DR. H. and DR. EGAN IHNE.—Time of blooming of Phenogams. *Flora*, March 1.
IHNE, DR. EGAN.—See under "HOFFMANN."
KOEHNE, E.—Review of J. G. Baker "On contributions to the flora of Central Madagascar," *Bot. Zeit.* March 23.
KRAUS, Carl.—Investigations upon the sap-pressure of plants (concluded), *Flora*, March 21.
NYLANDER, W.—New addenda to the lichenography of Europe, *Flora*, March 1.
PRENTISS, A. N.—Notes on the Adirondacks, *Torr. Bull.* 10. 43.
REHM, DR.—Review of "Exsiccata of Hungarian Fungi," *Flora*, March 1.
REINSCH, P. F.—On the alga-like and peculiar one-celled bodies in the coal of Central Russia (2 plates), *Flora*, March 11.
SCHRENK, JOSEPH.—Notes on the haustoria of some N. Am. parasitic phanerogams (Comandra umbellata) (with 3 plates), *Torr. Bull.* 10. 37.
SPENCER, JAMES.—Recreations in Fossil Botany, No. IX. (Reproductive organs of fossil plants), *Sci. Gossip*, No. 221. 100.
TRIMEN, HENRY.—Cinchona Ledgeriana (a reply to certain remarks by Dr. Kuntze in the Jan. No.), *Jour. Bot* 21. 131.
TRUMBULL, J. H.—See under "GRAY."
TSCHIRCH, A.—Review of H. Heyfelder's paper on "Pharmacognosy of the Vegetable Kingdom," *Bot. Zeit.* March 23.
TUCKERMAN, EDWARD.—A new Ramalina (California), *Torr. Bull.* 10. 43.
VASEY, GEO.—Two new species of grasses (Stipa from Oregon, and Aristida from S. Arizona), *Torr. Bull.* 10. 42.
WARD, LESTER F.—Plant-life past and present, (Synopsis of one of the "Saturday lectures" delivered at the Nat. Mus. Washington), *Science*, 1. 358.
ZACHARIAS, E.—Upon Albumen, Nuclein, and Plastin, *Bot. Zeit.* March 30.

BOTANICAL GAZETTE.

VOL. VIII. JULY, 1883. No. 7.

Some North American Botanists.

VII. STEPHEN ELLIOTT.

As one of the pioneers in American botany, Stephen Elliott holds a distinguished place. His labors and investigations in this department of Natural Science are so well known that every reader of the GAZETTE is familiar with his name. Those who knew him thus as a southern botanist, and hence honor his memory, are naturally desirous of learning more of him; of the position he held among his cotemporaries; of his attainments in other walks of life, and of all these traits of character and of intellectual activity of which, finding as they do, abundant proofs in that department of science with which they are familiar, they expect also to find in other phases of his life. It is to gratify this laudable desire that this sketch is undertaken.

Mr. Elliott died in 1830, at the early age of fifty-eight. All his cotemporaries are gone from whom personal reminiscences might have been obtained, but I am indebted to his grandson, Dr. John B. Elliott, now Professor in New Orleans Medical College and in the University at Sewanee, Tennessee, and also to a eulogy by Dr. James Moultrie, in November, 1830, before the Faculty of the Charleston Medical College, and to the "Philosophical Society" for much information of his early life.

Stephen Elliott came of good stock, and mental activity was an inheritance which he cultivated and transmitted to his descendants. The late Bishop Elliott, of Georgia, his son, was for a time, as his father before him had been, President of the South Carolina College, and ended his life well beloved and universally lamented, in the higher plane of the Christian ministry. Of his later descendants of another generation, yet living and doing honor to his name, it is not becoming to speak.

He was born at Beaufort, South Carolina, November 11th, 1771, the third son of William Elliott, who intermarried in 1760

with Mary Barnwell. His father died while he was yet young, and the care of his education devolved on his elder brother, William. The rudiments of his education he received in his native town. From there he was sent to New Haven, in 1787, and placed for a while under the tuition of Mr. (afterwards Judge) S. S. Baldwin. In February following he entered Yale College. There are letters, given in full in Dr. Moultrie's eulogy, written to his friends here after his death, from Judge Baldwin, of New Haven, and Prof. Hezekiah Howe, of Yale, in which they both speak in the highest terms of his college life. Judge Baldwin, with whom he carried on his preparatory classical studies for admission, says: "I soon found him a young gentleman of prepossessing manners, of steady habits, of great industry, of close application to the object of pursuit, and possessed of a sound, discriminating mind, with an early, fixed and full determination to become thoroughly master of all he attempted to learn. I had the pleasure of an intimate personal acquaintance with him during his connection with the college, and without making invidious comparisons, I can safely say that he ranked high in the estimation of the Faculty, of his classmates, and of all who knew him. His deportment was dignified and exemplarily correct. He not only attended with diligent perseverance to his classical studies, in which he was highly distinguished, but he also acquired much more general information than is usually attained by the most distinguished scholars of that University, and thus early laid the foundation for that literary distinction which adorned his future career in life. I well remember the remark of my friend, M. Leavenworth, Esq., a lawyer of reputation and a classical scholar, when speaking of Mr. Elliott, then a Senior in college, with whom he was intimately acquainted: 'Mr. Elliott was a young gentleman of more science and general information than any he ever knew of the same age and standing.'"

The following incident, related by Prof. Howe, exhibits the bent of his mind at that early age: "When he graduated his was the only English oration delivered by a Bachelor (there were two candidates for the Master's Degree). The subject was on 'The Supposed Degeneracy of Animated Nature in America.' As this was then a novel subject, having been but recently suggested by Buffon and Raynal, it was one of considerable interest to Americans, and excited much attention among the literati of our country, and I well recollect hearing Mr. Elliott's oration spoken of as an able refutation of the theory."

On his return home, after graduating at Yale with one of the

highest honors, he applied himself to agricultural pursuits. In 1796 he intermarried with Esther Habersham, daughter of Hon. James Habersham, of Georgia. About that time, or a few years previously, he was elected a Representative to the State Legislature from the Parish of St. Helena, and, with the intermission of a few years, he continued to serve, first in the House and afterwards in the Senate, until 1812. It was during the interval of his absence from the Legislature (between 1800 and 1808), that he devoted himself to the study of Botany, and commenced to prepare the material for a work, which, published many years afterwards, forms no inconsiderable part of his fame, and through which he is best known to the scientific world.

In 1808 he returned to the Senate, and at once took a leading part in the important business before that body. The "Free School" system of South Carolina, since modified, enlarged and improved, owes its origin to his sagacity, as a necessary correlative to the extension of the right of suffrage. That and the "Bank bill" were both his measures The latter was one creating the "Bank of the State," which was to be the financial agent of the State and under her control. On its enactment, he was unanimously chosen President, in which capacity he continued to serve, by annual re election, to the day of his death, thus justifying the confidence reposed in him by the Legislature.

This appointment caused his removal to Charleston, and opened the field for larger and more varied usefulness. It brought him more into contact with men of the highest culture, and with the institutions of learning. In a year after, he was elected President of the Charleston Library Society. On the death of Dr. Marcy, of the South Carolina College, he was elected President by the Trustees in that institution, to fill the vacancy. He accepted the office for a time, and then resigned, rather against the bent of his inclination and sympathies, but for personal reasons which do him honor. At the founding and organization of the Charleston Medical College, towards which he aided very materially, he had the gratification of being chosen Professor of Botany and Natural History. He was the first and, during his lifetime, the only President of the Philosophical Society of Charleston, which owed its origin mainly to his influence and exertions.

Not least among the literary labors of Mr. Elliott was that of his connection with the *Southern Review*, for a time its editor, as well as contributor to its columns. "The institution of the *Southern Review* may be regarded as an epoch in the scientific

and literary history of our State," says Dr. Moultrie, one of his cotemporaries, "and to Mr. Elliott is due the praise of having established it as such." The *Review* continued its honored career of usefulness for over thirty years afterwards, and only went down during the dark disasters of the war.

The versatility as well as the vigor of Mr. Elliott's mind may be seen in the variety of attainments in which he excelled. Beginning life as a legislator, in which capacity he served for many years, he took prominent and leading parts in many of the important measures of that time. As stated above, the "Free School" system of the State was one of his favorite measures. His advocacy of the Bank bill, and the ability displayed in elucidating financial matters, caused his election to the Presidency of the Bank of the State, which he retained by annual re-election to the day of his death. And it was while administering the affairs of the bank (a business, we may venture to believe, uncongenial to his tastes and to the development of his natural inclinations and abilities), that he found time for literary and scientific pursuits, which of themselves would have placed him in the foremost rank among men of letters.

To the readers of the GAZETTE, Mr. Elliott is chiefly known as a botanist. His "*Sketch of the Botany of South Carolina and Georgia*," as he modestly calls it, but which really was so nearly complete as to leave little to be added afterwards, was undertaken to supply a need which then existed for a more full and more accessible representation of the Southern flora. Though Southern plants had been collected and described by Michaux, Pursh and other casual visitors, there had been no special work devoted to the subject since the publication of Walter's *Flora Caroliniana*. That was only a beginning, and was necessarily imperfect, and it was written in Latin. Mr. Elliott added about 180[1] genera and over 1,000 species to Walter's contribution, and his "Sketch" continued to be the chief authority among Southern botanists for this latitude until the appearance of Chapman's *Flora of the Southern States*, in 1860. The first volume of the "Sketch," dedicated to Dr. Henry Muhlenberg, of Pennsylvania, was published in 1821; the second volume, dedicated to Dr. James Macbride, of South Carolina, in 1824. They were originally published in parts, and the interval between the volumes is thus explained.

[1] These figures are inserted on the authority of Dr. Moultrie. I have not a copy of Walter's Flora at hand to verify the statement.

The descriptions of species, worded in concise form, and embodying the prominent and distinguishing characters, are printed in Latin and English in parallel columns, with additional full English notes, in which are given the habitat, time of flowering, local names, and often the reputed medicinal properties, and other points of historical interest. These appended notes have often furnished the means of identifying his species. The whole work exhibits great care and scientific accuracy in its preparation. The arrangement is by the Linnæan system, the one mostly in use by the botanists of that day. The more natural classification of Jussieu was then rapidly gaining favor, and was altogether so much more satisfactory, that Mr. Elliott, before the conclusion of his volume, saw the necessity of remodeling his work, and makes allusion to it in the Preface to the second volume. With this design, he had in preparation a Prodromus founded on the Natural Orders of Jussieu, which he was to have annexed to the "Sketch." It was but half finished when death closed his earthly labors.

Dr. Moultrie, to whom I am indebted for many of the data contained in this paper, says of him: "Nor was it to Botany, Mineralogy and Geology, that his intelligent and spreading curiosity was confined. There was scarcely a department of Natural History which had not received a portion of his attention. No one was so well acquainted with the Icthyology of South Carolina and Georgia. In early life he formed a collection of all the present known species, with a view to their description and publication, but the want of books and that inherent diffidence which made him mistrustful as to what others may have done before him, caused him to postpone the undertaking. He was not less interested in Conchology and the Natural History of Insects. In each of these departments he had made no inconsiderable progress. It is, perhaps, not generally known, that in addition to his various other attainments, he was a very good draftsman, and that to the pen of the Philosopher he also united that of the Poet. The testimonials of this latter gift are probably sufficient, as I have been informed, to form a volume, and fully equal to what might have been expected from the flowing harmony and melodious fullness of his prose writings."

Mr. Elliott's name is still held in honored remembrance by those of a later generation who only know him by his literary labors. The "Elliott Society," of Charleston, established in 1853, was a fitting tribute to the memory of one who had done so much for science.—H. W. Ravenel.

Vitis palmata, Vahl.

Vitis palmata, Vahl, has been cultivated in the Paris Botanic Garden for one hundred years or more, and has thence found its way into other European gardens without, as it seems, attracting the attention of botanists. On the banks of rivers in Illinois, some eighty or ninety years ago, Michaux discovered this *Vitis,* which he, with the very scanty herbarium specimens before him, stowed away with his *Vitis riparia,* leaving, however, with it his original label: "*Vitis rubra, abonde sur les rivières aux Illinois,*" but never even mentioning the name in his Flora. When, twenty-six years ago, I studied Michaux's collections in the *Jardin des Plantes,* I was struck with the peculiarity of the specimens, especially with that which is preserved in the General Herbarium;[1] its seeds were so odd that I almost suspected a confusion. In this country it seems to have remained quite unknown; in Torrey and Gray's Flora it is suggested that it might be a form of *V. æstivalis.* Vahl's statement that it came from Virginia is, of course, erroneous, but not more so than many other American localities published in those, geographically, dark ages.

Mr. H. Eggert has had the good fortune to re-discover this species last fall, and collecting it again this summer, has furnished observations and specimens which permit me to complete the history of this long neglected plant.

VITIS PALMATA, Vahl. A vigorous climber with red branches (and often also red petioles), young shoots, angular and ribbed, older ones losing the bark in large flakes; diaphragms rather thick; stipules very short, rounded, early deciduous; leaves smooth, glabrous (or on the nerves beneath with short, straight hairs), dull and rather dusky green, cordate with a broad sinus, mostly deeply three- or sometimes five-lobed, lobes when long, widest in the middle, contracted at base and mostly slenderly caudate-acuminate, with few coarse teeth; flowering racemes compound, long peduncled; berries black without any bloom, rather small (four to five lines in diameter); seeds large for the size of the fruit, slightly notched on top, single, and then nearly

[1] I may also say that in hunting through Michaux's *Vitis,* I came across a well characterized specimen of *V. rupestris,* also preserved in that sheet of *V. riparia.* As Michaux never botanized west of the Mississippi, where *V. rupestris* is found from Missouri to Texas, it remained a question where he could have obtained that specimen, which had no label attached to it, until a few years ago Dr. Gattinger discovered the species on sand-bars in the Cumberland river near Nashville, a region well explored by Michaux.

globose, or in twos, when they are hemispherical and very flat on the ventral side; beak very short, chalaza narrow, elongated, groove without any visible rhaphe.

Michaux found it abundant on river banks in Illinois, but he may have confounded it with *V. riparia*, which is very abundant there. Mr. Eggert collected it in Missouri, on the Mississippi, in low bottom land, opposite Alton, not far above the mouth of the Missouri river, where it is found with *V. riparia*, flowering later than any other of our species here, in this very late season apparently not before the 15th or 20th of June; it matures in October, and the berries remain on the vine till November and later; their taste is sweet, without any disagreeable admixture. The plant, like *V. riparia*, grows readily from cuttings.

The species resembles *V. riparia* in the broad sinus of the leaves and the form of the seeds, but it is distinguished by the deep red color of the stems, which are angular when young, not terete, the thick diaphragms, the very small stipules, the dull, dusky color of the leaves and the form of their lobes, the bloomless berries, the large seeds and the late flowering period. With *V. cordifolia* it has very little in common, except the thick diaphragm and the bloomless berries. The absence of a prominent rhaphe on the seeds distinguishes it at once, and no other species could possibly be confounded with it.—G. ENGELMANN, *St. Louis, June 7, 1883.*

Notulæ Californicæ.

Saxifraga malvæfolia, Greene. Bull. Torr. Club. IX. 121. In addition to the single specimen on which the species was founded, two more have lately come to light in the herbarium of the California Academy; and this further information has been obtained. The plant was collected by Dr. Kellogg and Mr. Harford, in the autumn of 1876, on Santa Cruz Island, not Santa Rosa, as stated in the note accompanying the printed character. All three of the specimens now known show strongly the woody fibrous root (without any trace of bulb, or tuber), the leaves appearing simultaneously with the flowers, and the broad calyx, which are the characters by which the species is well distinguished from the closely allied *S. Parryi*, Torr , known only on the main land in the south part of the State.

Lythrum Hyssopifolia, L., not accredited to California, was collected by the present writer, at Calistoga, as long ago as 1874, and is observed to be very common near the shore of the bay at West Berkeley.

Pentachæta exilis, Gray. Bot. Cal. I. 305. I doubt if the rays in this species are ever of any color but white. What may pass for "sulphur color" in old specimens is, I think, the result of long keeping in the herbarium: such a change of color as usually happens to the white rays of Compositæ when the specimens are some years old. Everywhere, as seen growing, the rays are white, with usually a purple tinge on the under surface.

Pentachæta alsinoides, Greene. Bull. Torr. Club. IX. 109. Messrs. Kellogg and Harford collected abundant and excellent specimens of this most distinct species, at Mission Dolores, in the city of San Francisco, as long ago as 1868. I have sought vainly for any trace of ligules in their specimens, which are younger than those of my own gathering last year on the Berkeley hills. I find it, this year, at Vallejo, while Mrs. M. K. Curran brings in abundance from El Dorado county. Growing with it, in the district last named, Mrs. Curran finds what will have to be called

PENTACHÆTA APHANTOCHÆTA, namely, the *Aphantochæta exilis*, Gray. Pacif. R. Rep. IV. 100, referred, in Bot. Cal. I. 305, to *Pentachæta*, as variety of *P. exilis*, Gray. Its herbage, corollas, akenes, pappus, etc., all have characters by which the species is readily distinguished; and in the very copious specimens on hand there is no trace of any running together.

Grindelia hirsutula, Hook & Arn. Under this name two clearly distinct species are included. One is more slender, with short involucral scales, and smaller heads, which are nodding in the bud. The other is stout, holding its young heads rigidly erect, and having long, spreading involucral scales; but will any one be able to say which is the original *G. hirsutula?* The name is equally suited to both.

Grindelia cuneifolia, Nutt., is assuredly an excellent species, very readily distinguishable from *G. robusta*, Nutt., by its suffrutescent growth, and different time of flowering. It is three or four feet high, with a woody trunk, an inch or two in diameter, with a very dark, smooth bark. Its season of flowering is from October to the end of the year. *G. robusta* is always wholly herbaceous, and is done flowering by the end of August.

Both Dr. C. C. Parry and Mrs. Curran have this year brought in from the Antioch region good specimens of what Dr. Kellogg once described as *Stylocline acaule*, and which Dr. Gray, in Bot. Cal. II. 456, refers, as a form, to his own *Evax caulescens*. It appears to be so good a species of the genus last named that it even invalidates the subgenus *Hesperevax;* for it has strictly the

habit and the umbellate inflorescence of *Euevax*. The plant is of robust habit, but depressed, and nearly stemless, and the heads are borne in crowded umbels subtended by rosulately arranged foliage. The branches are stout, but short and horizontal. Although the specific name proposed by Dr. Kellogg, some years since, is neither strictly applicable, nor in the genus *Evax* very distinctive, yet I suppose it ought to be retained; and the specimens now collected will be distributed under the name EVAX ACAULIS, Greene.

The curious *Madia citriodora*, Greene, Torr. Bull. IX. 63, with akenes so strangely like those of a *Hemizonia*, hitherto known only from Yreka, in the extreme north of the State, is also now found by Mrs. Curran, not far from Sacramento. Her specimens are larger and more branching than the original ones, but have the same pleasant fragrance, with all the technical characters of the species.

Madia Yosemitana, Parry, I find in the herbarium of the California Academy, collected long ago by Dr. Eisen, near Fresno, and by Mr. Elisha Brooks, in the upper part of the Sacramento Valley, near Oroville. These specimens are all very much larger, with larger heads, and the flowers in them much more numerous than in the Yosemite plant.

It is not noted in the Bot. Cal. that two of the species of *Madia*—*M. Nuttalii* and *M. Bolanderi*—are perennials. That the last named species is so, I discovered but recently, and I now conclude that Mr. Pringle's Mt. Shasta plant, which was distributed as a new species, is only a variety of *M. Bolanderi*, differing from the type mainly by its shorter pappus. In Mr. Bolander's specimens I find occasionally a short pappus on a ray-akene.

It is nowhere noted in the books that the genera *Layia* and *Hemizonia* have different seasons of flowering, the former being vernal, the latter autumnal. There are, indeed, in the case of *Hemizonia* a few exceptions. *H. luzulæfolia*, DC will sometimes begin to flower in April, but it is in its best state in October. *H. Kelloggii*, Greene, is more strictly vernal, being in full glory during the month of May.

Asclepias incarnata, L. This species, which, so far as I can see, is not accredited to the Pacific slope of our continent, appears to have been collected in a swamp near San Jose, long ago, by Dr. Bolander. An excellent specimen, so ticketed, in the doctor's own handwriting, I find in the herbarium of the Academy.—E. L. GREENE.

GENERAL NOTES.

Note on Phallus togatus, Kalchb.—Probably most of the students of fungi of the United States were surprised at seeing, in the May number of the GAZETTE, a new name attached to the excellent plate of the *Phallus*, from Pennsylvania, collected by Mr. Rau. The species is certainly one long known to mycologists, although they have not been unanimous in deciding upon the name to be given it. The fungus is not rare near Boston, and I have seen it living on several occasions, once almost under the window of the dining-room of my boarding house in Cambridge. I have collected it in the so-called "egg" stage, that is, before the rupture of the peridium, and have watched its growth until the veil was fully expanded. The species has been referred by some writers to *P. indusiatus*, Vent., by others to *P. Dæmonum*, Rumph., and by others still to *P. duplicatus*, Bosc. The determination of the earlier described species of *Phallus* is notoriously difficult, because one has to trust almost entirely to figures which were drawn from poor and frequently pressed material, and, in several cases, it is more than probable that what was wanting in the material examined was supplied by the imagination of the artist.

The species figured in the GAZETTE certainly does not correspond to Ventenat's plate of *P. indusiatus* in the *Mem. de l' Inst. Vol. I., Pl. VII.*, where the veil reaches almost to the ground, is cylindrical and not campanulate in shape, and has much larger perforations. Nor does it seem to me that the species in question is the same as the form figured in the *Dict. d'Hist. Nat. Pl. VII., fig.* 1, as *P. indusiatus*, and later referred by Schlechtendal to his *P. tunicatus*. I think that the species is more properly *P. duplicatus*, Bosc, found by him in South Carolina, and described and figured in his "*Mémoire sur quelques espèces de Champignons des parties méridionales de l'Amérique septentrionale*" in the memoirs of the *Gesellschapt Naturforsch Freunde, Vol. V., p. 86, Pl. VI., f. 7*, published at Berlin in 1811. The plate of Bosc, although far from satisfactory, represents our plant in its essential features. The figure is larger than our plant, although I have seen specimens nearly as large, but the relative position and appearance of the pileus and veil are the same as in our species as usually seen. The figure given in the GAZETTE shows the veil fully expanded, and I have watched the fungus and seen it pass through all the stages from that figured by Bosc to that shown in the GAZETTE. The structure of the fully expanded veil in this species is cribrose rather than clathrate, and although it eventually becomes slightly campanulate and is a third as long as the stipe, or even somewhat longer, one usually finds the veil more or less wrinkled around the stipe. In short, I see no reason why we should not consider that the *Phallus togatus* of Kalchbrenner is the *P. duplicatus* of Bosc, as it corresponds more closely to that species, both in anatomical character and in its habitat than to any other, and, to state the case conversely, if this is not the species of Bosc, mycologists will find it next to impossible to tell what his *P. duplicatus* is.

If we accept this determination as correct, as far as it goes, the question remains whether *P. duplicatus*, Bosc, can not be merged in some previously de-

scribed species. The species, it hardly seems to me, can be referred to *P. indusiatus*, or any of the forms designated by different writers under that name. As I understand that species, the veil is always more delicate and with much larger perforations than in our *P. duplicatus*. Of the true *P. indusiatus* I have seen specimens from Cuba, and, although it is said to occur also in the United States, I have never been so fortunate as to find it. The name *P. indusiatus* occurs in my List of Fungi, near Boston, in *Bull. Bussey Inst., Vol. I., p. 433*, but, as was explained in a later number of the *Bulletin*, it was a slip of the pen, and the name intended was *duplicatus*. *P. Dæmonum* includes a number of forms of the Eastern hemisphere, and I have no material for forming an opinion of their relation to our fungus. *Phallus Brasiliensis*, Schl., whatever its relation to our plant may be, certainly can not replace the name *duplicatus* which has priority. In conclusion, then, it seems to me that *P. togatus*, Kalch., is nothing more than *P. duplicatus*, Bosc, which name must be retained unless some source of information, at present unknown to me, should show that the species is to be included in *P. indusiatus*.—W. G. FARLOW.

Chorisis in Podophyllum.—I found a curious specimen of *Podophyllum peltatum*, which, at the advice of Dr. Asa Gray, I will try to describe for the readers of the GAZETTE. It had a scape of about the size of the ordinary flowering plant, maintaining an almost equal thickness the entire length, the flower being borne sidewise at the tip, with no pedicel of its own. The inner row of petals showed an excellent gradation of *dédoublement*, from the entire petal, through one cleft in the middle, to a petal which was divided into two distinct parts. Of the twenty-one stamens, two were grown together, and on other plants I have occasionally found even three of them thus developed. Cases of *dédoublement* in the stamens are by no means rare with us.—AUG. F. FOERSTE, *Dayton, Ohio.*

Notelets.—I have a few field-notes to communicate. In the first place, I am much impressed this year by what may be called the excessive blooming of the maples; I certainly have never seen anything like the display made by *Acer saccharinum*, L., a week ago, and now by *A. pseudo-platanus*. In both cases I speak of trees in cultivation about our city streets. *A. dasycarpum*, Ehr., a frequent shade tree, is now in abundant fruit. I did not notice any unusual blooming in the species *A. rubrum* and *A. platanoides*. In the latter I have long found it extremely difficult to discover the pistillate flowers; the staminate are certainly much in excess. I know two trees of *A. rubrum*, L., standing side by side, that are strictly diœcious, and others that have a tendency in that direction. *A. saccharinum* came into flower here May 4th.

The alders, of which I noted the surprising lack of staminate catkins last year, have this season outdone themselves in their profusion of male flowers. They were a most beautiful sight. The date of blooming of some other plants may be of interest. April 11th, Viola odorata; 12th, Crocus vernus; 19th, Epigæa repens; 26th, Taraxacum Dens-leonis; 27th, Forsythia virdissima and Magnolia grandiflora; May 3d, Æsculus Hippocastanum in leaf, in flower the 21st; 5th, Oakesia sessilifolia; 9th, Amelanchier Canadensis; 13th, Menyan-

thes trifoliata, Betula alba, var. populifolia, Carpinus Americana, and Arisæma triphyllum; 19th, Saxifraga Pennsylvanica and Ranunculus abortivus; 21st, Geranium maculatum.

Last autumn I noted the remarkable second flowering of *Menyanthes;* in consequence of that effort, its flowers are rather scarce this spring.—W. W. BAILEY, *Brown University, May 23, 1883.*

Cundurango.—The plant received by the Botanic Garden of Harvard University from the Agricultural Department at Washington, about ten years ago, has this year blossomed, for the second time. It proves to be, without doubt, a *Macroscepis*, as Prof. Ernst (in *Trimen's Jour. Bot. 1872, 268*) rightly conjectured. It is not the original Humboldtian species, nor is it Fendler's No. 1051. It is said that there is more than one *Cundurango;* but it may be suspected that the plant which Triana, in *Bull. Soc. Bot. France*, XX. 34, has named *Gunolobus Cundurango*, and also *Marsdenia Reichenbachii*, is the same as ours It has very marked characters, especially in the very thick and fleshy lobes of the corolline corona; but I have not the means of knowing certainly whether it is a described species or not.—A. GRAY.

Notes on the Buckeye and Viburnum nudum.—While in the Ash, Beech, Ironwood and other young trees the root soon becomes woody, in the Buckeye it remains *fleshy* for quite a number of years. Specimens that by the rings of scars left by terminal bud scales indicated ages of six, seven and eight years, still had such soft roots that these could be cut with the thumb nail. The tap root is large (several times as thick as the stem of the plant), and spindle shaped, filled with a fleshy white pith, while the layers of wood and bark surrounding this are rather thin. The rootlets are provided with small, whitish, *tuberous* branches and tips.

Another interesting feature of this young Buckeye is that very frequently (I might almost say usually), the two or four buds above the cotyledon scars are *alternate;* above these the normal position again is resumed.

The *Viburnum nudum* ordinarily has opposite buds, though it is by no means a rare occurrence to find them in *whorls of three*, particularly on suckers or upright branches. This mode, however, is continued only by the *main axis*, and *in no case* have I observed that *branches* of such stems bear ternate buds; they always have the usual opposite ones. A sort of "missing link" was supplied by a stem that had at a number of nodes two branches, one-third of the circumference apart, while at the next node was a single branch directly above where the third would have completed the whorl.

In several instances all the buds were alternate, in some again they were irregular.

Cornus stolonifera shows the same departure from the regular mode of branching, but in this species the alternate arrangement is more common, while the ternate whorl is rare.—WILLIAM WERTHNER, *Dayton, O.*

Direct Observation of the Movement of Water in Plants.—In the *Am. Jour. Sci.*, Mch. '83, p. 237, Dr. G. L. Goodale calls attention to Vesque's direct observations of the absorption of water by plants. The method there given is

as follows: A stem with leaves attached is cut very obliquely (under water), then attached to a glass slide, the cut surface being covered by a thin glass cover or another slide. Some freshly-precipitated calcium oxalate is introduced into the water under the cover-glass when the current passing into the stem is made evident by the granules which are drawn to the mouths of the vessels, accumulating as little plugs at their openings and finally being sucked in. In some experiments to verify these observations, made by Mr. J. M. Waugh under my direction in the botanical laboratory of Purdue University, an improvement upon the method used by Vesque was made. The method as before given was successful, but only after repeated trials and with considerable difficulty in properly illuminating the upper cut surface so as to make the grains of the calcium salt visible. Thinking that other teachers may like to know just the way to make this easy demonstration a success I give the details of the experiment.

The stem of the common *Clematis* of cultivation was selected because of its relatively large vessels. This, after being cut obliquely with a razor, was attached to an ordinary slide by means of two rubber bands and covered with thin glass. The whole of this operation must be performed under water. The superfluous water was then wiped from the slide and it was transferred to the stage of the microscope. The stem must be illuminated from above, either by the mirror, if that swings above the stage, the Lieberkuhn, or the side condensing lens. The lenses best adapted for this observation are the $\frac{3}{4}$ or $\frac{2}{3}$ objective with the 2-in. eye-piece. Instead of the calcium oxalate, indigo rubbed into a thin paste with water was employed. The advantage of indigo over the white calcium oxalate lies in the fact that it is very dark, and hence the small grains can be easily seen. The process, as shown by these granules, is a very interesting one. Some collect at the edges of the larger vessels, and some pass directly into the cavity. The observations carried on by Mr. Waugh seem to show that the cross between the imbibition and cavity theories is nearer the truth than either. The granules stick against the edges of the cut wall because water is imbibed by it, and the others continue up the cavity of the vessel because of the current there. Suddenly pinching the stem sets the current backwards, and quickly removing the leaves stops it altogether.—C. R. B.

EDITORIAL NOTES.

THE SUBJECT of bacteria is beginning to receive the attention, at the hands of the medical fraternity, that its great importance merits. Two notable works have just appeared from the press of W. T. Keener, Chicago, on bacteria and their relation to disease, by Drs. Gradle and Belfield, of the Chicago Medical Colleges. Both works are carefully written, and will prove interesting reading to others than the class to whom they are specially addressed.

FUNGOUS PLANTS, as a source of food, are receiving increased attention in both this country and Europe. A monthly journal, specially devoted to them,

has recently appeared in Germany, under the name of *Zeitschrift für Pilzfreunde*, containing "popular articles on edible and noxious fungi." Each number has twenty-four octavo pages and a colored plate with several figures, which, considering the low price of the journal (four marks a year), are fairly executed. The third number contains an article on the preservation and preparation of mushrooms for the table, in which six methods are given for preserving, besides drying, and seven recipes for cooking. We can not forbear giving the names of the dishes as an indication of the delicacies allowed to go to waste in our fields: Champignon-fricassée, mushroom sauce, mushroom soup, stuffed mushrooms, champignons à la provençale, champignons à la Cussy, and mushroom ketchup.

THE LIST OF PLANTS from which liquid water exudes is becoming quite large. Volkens describes the water-pores of 150 species, distributed through 91 genera and 36 families.

CHAREYRE, in *Comptes Rendus*, traces a connection between cystoliths and the hairs over them. He states that calcification begins in the hair, and in most cases goes on to form a calcareous mass in the epidermis below, which mass is the cystolith. Dr. Goodale, in *Science*, suggests that it is an interesting fact in this connection that cystoliths occur in leaves of plants which are perfectly smooth. We would also suggest, as equally interesting, that in *Pilea* splendid cystoliths occur, which are not in the epidermis at all, but several layers of cells below.

MR. W. W. CALKINS, of Chicago, has a splendid collection of Florida woods, containing 184 species of the 208 credited to that State. Each specimen is 5 to 10 inches in diameter, and 10 to 12 inches long. A list of the species has been published.

MR. GEORGE E. DAVENPORT's check list of N. Am. Ferns has just been received, and should be in the hands of all botanists for convenience in cataloguing and exchanging. The moderate price of 25 cents a dozen places them within the reach of every one. The supplement to the catalogue of the Davenport Herbarium is also in hand, and adds 26 species, one being new. Mr. Davenport can be addressed at Medford, Mass.

DR. H. F. HANCE has just described a new *Podophyllum*, from Formosa, in the *Journal of Botany*. Heretofore the genus contained but the two species, our own *P. peltatum* and the Himalayan *P. Emodi*, but recently discovered in the Tangut country by Przewalsky, and both these species have solitary white flowers, differing chiefly in the fact that our species has twice as many stamens as petals, while the Himalayan form has stamens and petals equal in number. This new Chinese *Podophyllum* (*P. pleianthum*) has much larger isostemonous flowers of a dull red color, arranged in a pendulous group of five or six in the fork of the two stem-leaves; they are bractless and exhale a strong odor of putrefying flesh. This discovery is what might have been expected since the discovery of *Diphylleia* and *Caulophyllum* in Japan and Sachalin, and of *Jeffersonia* in Manchuria.

MR. A. B. MORGAN has published a second part of his "Mycologic Flora of the Miami Valley, O.," bringing up the genus *Agaricus* to 146 species.

SCIENCE still continues to give botany as much attention as at first, in the form of independent articles, book reviews, communications, and a weekly summary. Dr. W. G. Farlow looks after the latest information regarding cryptogams; the other writers were mentioned in our notice in the March GAZETTE.

ACTINOMYKOSIS is the name of a new disease in man and the lower animals caused by a fungus of the genus *Actinomyces*, which forms tumors near the angle of the jaw and proves fatal when it becomes generalized. It was the subject of remarks by Dr. Thomas Taylor and Dr. D. E. Salmon, at the meeting of the Biological Society of Washington, on the 25th of last month.

IN THE FOURTH volume of the "Monographiæ Phanerogamarum," just published, Dr. Engler monographs *Burseraceæ* and *Anacardiaceæ* and Count Solms-Laubach *Pontederiaceæ*. Two new genera of *Anacardiaceæ* are proposed, *Pleiogynium* on *Spondias acida*, Soland, and *Pseudospondias* on *Spondias microcarpa*, Rich.

A PRIZE of 500 francs has been offered by the *Société de physique et d'histoire naturelle de Genève* for the best monograph of a genus or family of plants. The prize was founded by the elder DeCandolle. The manuscripts are to be sent to Prof. Alph. DeCandolle, at Geneva, before October 1, 1884, and the members of the Society are not admitted to the contest.

THE PROCEEDINGS of the Society for the Promotion of Agricultural Science, just published, contains quite a number of articles on applied botany.

PROF. C. E. BESSEY has a pleasant article in the Transactions of the Iowa Horticultural Society, for 1882, entitled On Parasitic and Other Fungi, in which he points out the popular danger of entertaining extreme views of the harmfulness of these plants, not properly discriminating between good and bad.

AN ALPHABETICAL INDEX to the first ten centuries of Ellis' North American Fungi has been issued. It was compiled by W. C. Stevenson, jr., and is most carefully and satisfactorily done.

THE REPORT of the State Laboratory of Natural History of Illinois, which was lately issued, shows that that State is fully alive to the great need of an investigation of the parasitic fungi. During the collecting season of last year and the latter half of the preceding year, Prof. A. B. Seymour has been enabled to give his whole time to collecting throughout the State, with assistants to take care of the material as it arrived at the laboratory. A working library, herbarium, and instruments have been secured, and it is now proposed to work up this material along with future accessions into reports that will be of permanent value to the citizens of the State. It is an enterprise in the right direction, and deserving emulation.

DR. J. J. BROWN, of Sheboygan, Wis., has for several seasons experimented with field fungi for culinary purposes. He finds no fungi that one would be likely to gather for eating that are violently poisonous. His method for dis-

covering the valuable kinds is one that requires no scientific knowledge of the plants, and commends itself for its practical common sense. He gathers fresh, clean-looking specimens. If they have a bad or unpleasant odor when cooking they are discarded; and one will soon be able to tell the good from the bad at this time with considerable certainty. A small amount of the cooked fungus is then eaten; if it has a pleasant taste and no disagreeable results follow, it is partaken of more freely next time, and is soon put on the list of valuable kinds. Tasting of the fresh fungus is but little assistance, as an acrid or nauseating property is often dispelled in the preparation. There is no doubt that the danger of fungus-poisoning has been unnecessarily exaggerated. With the caution just pointed out the danger is so greatly lessened that it is practically reduced to zero, and no one need hesitate to make use of this abundant supply of nourishing and palatable food. It may be added that many sorts will be found harmless enough, but of no more culinary value than so much grass or wood, being either not juicy or without a rich flavor.

ON THE FIRST PAGE of the sketch of Dr. William Baldwin, published in our last number, at the end of the seventh line, for "Josiah," read "Joshua."

CURRENT LITERATURE.

A Revision of the genus Fraxinus, by TH. WENZIG, in Engler's *Botanische Jahrbuch*, iv. p. 164–188 (1883), is evidently the result of much pains-taking, and quite free from all tendency to undue multiplication of the species. In the American species he generally follows, and much commends, the Synoptical Flora of North America; making, however, certain changes, the propriety of which is to be questioned.

F. GREGGII, Gray, is given as a synonym of *F. Schiedeana*, Cham. & Schlecht. (which was Dr. Torrey's original suggestion), upon the evidence of the description. Wenzig has only Schiede's plant; we have only Gregg's and Bigelow's. So the case is not yet settled. A collection of our specimens with Wenzig's description of *F. Schiedeana* leads to a belief that the two are not identical, but we hope to have them directly compared.

Coming now to the American *Fraxinasters*, Dr. Wenzig makes the two subsections, *Epipteræ* and *Peripteræ*, which we have insisted on, though without giving them names. But to our surprise he refers our *F. viridis* to the latter, thus separating it widely from *F. pubescens*, the samaræ of which are just the same. He does not figure the fruit of our *F. viridis*, which he has from "Brendel and Rühl" (Riehl?), surely either the wrong thing, or in abnormal form. Taking his species in order we have:

F. AMERICANA, L. To this is referred *F. juglandifolia* of Willd., as well as of Lam., doubtless on authority of the herbarium, and as the character by Willdenow looks that way, we may conclude that the reference of his plant in the Synoptical Flora to *F. viridis* is a mistake. The reference of the original of this latter name we will discuss in another connection. *F. epiptera* of Michaux is of course referred here.

Var. MICROCARPA and var. TEXENSIS, Gray, are simply adopted.

Var. UHDEI and var. OVALIFOLIA, are from Mexico, coll. Uhde, and are unknown to us.

Var. PISTACIÆFOLIA is founded on *F. pistaciæfolia*, Torr., and we are unable to draw distinct limits between its forms and those of *F. Americana*.

Var. CORIACEA is *F. pistaciæfolia*, var. *coriacea*, Gray. This is certainly going too far altogether. No doubt there is a distinct species, for which the name of *F. velutina*, Torr., is the oldest, and that of *F. coriacea*, Watson, the more appropriate.

F. PUBESCENS, Lam., well described, and it appears that *F. expansa*, Willd. Berl. Baum. (1811) belongs to it. But Wenzig adds:

Var. BERLANDIERIANA, on *F. Berlandieriana*, DC. And in a foot note: "*F. Berlandieriana* DC. samaris apteris est *Fr. pubescentis* Lam. varietas, non *Fr. viridis* var. ut cl. Gray vult." This without seeing Berlandier's specimens. We have before us, from the latter's herbarium, counterparts of the specimens sent to Geneva. The form from Austin, with foliage only, has a developing leaf, which is perfectly glabrous, as are the adult leaves and branchlets. The fruit bearing specimens, from the Nueces, are equally glabrous, with traces of the barbellation along the midrib, especially in the axils of the veins, which is common in our *F. viridis*, of which we take it to be a mere variety. Wenzig has Mexican specimens of Schaffner's collection, as we have also, but not under the same number. These Ashes from San Luis Potosi, also Monterey, are rather peculiar, but we judge are of this species.

Var. LINDHEIMERI, on Lindheimer's No. 653, 1847. We have it also, coll. 1848, with forming fruit. Clearly same as the above.

F. VIRIDIS, A. Gray. This, as just stated, is placed in the "Peripteræ" division, next to *F. platycarpa*, where it does not at all belong. *F. viridis*, Michx. f. is referred as synonym to *F. Americana*, on the strength of Michaux's citation of *F. juglandifolia*, Lam., and on his description and figure of the fruit. And it seems from another note, that Koch found an original specimen in herb. Jussieu, which was *F. platycarpa*, and also in other herbaria both *F. Americana* and *F. pubescens* under this name. To all which it is to be said: first, that the foliage of Michaux's plate can not belong to *F. platycarpa*, which grows only south of the range in which Michaux observed his Green Ash, while the figure of the fruit is widely different. Michaux's description of the tree and its foliage exactly applies to the Green Ash. He says it is Muhlenberg's *F. concolor*, and he saw it at the latter's stations on the Susquehanna. He should have adopted this name, and we should have been justified in doing so, perhaps, though only a catalogue name. The perplexities of the case we long ago cleared up, as we still believe, by the hypothesis that in Michaux's Sylva, the fruit of *F. Americana* and *F. viridis* are mismatched on the plate, and consequently the author described the fruit of the Green Ash from the plate or from the specimens figured on the plate.

So, unless we fall back on the excellent name of *F. concolor*, Muhl., we must still, for the Green Ash, write *F. viridis*, Michx. f. (in part), Gray, Man., etc. Yet we may be driven to another alternative, and do with the whole of the Green Ash what Wenzig has done with a part of it, that is, reduce it to a variety of *F. pubescens*. Undoubtedly the two appear to run together.

Of the true *Peripteræ*, viz. F. PLATYCARPA, F. QUADRANGULATA, F. ANOMALA, and F. OREGONA, there is nothing here to remark. ASA GRAY.

A Revision of the genus Clematis of the United States, by Joseph F. James. From the Jour. Cin. Soc. Nat. Hist. 6, July, 1883.

This is a paper read by title before the American Association of 1882. The author has "collected the descriptions of all the species of the United States," and has given their geographical range and synonymy. Of course there will always be a difference of opinion as to whether certain forms should rank as species or varieties. For instance, *C. Scottii*, Porter, is probably only a form of *C. Douglasii* with broader leaflets; while the author will hardly be followed in reducing *C. Fremontii*, Watson, to a variety of *C. ochroleuca*, Ait., and the same might be said by some of *C. coccinea*, Engelm, and *C. Pitcheri*, T. & G., as varieties of *C. Viorna*. It is hardly correct to say that "the genus *Clematis*

forms the tribe *Clematideæ* of *Ranunculaceæ*," as there is associated with it a small genus of Southern Asia, *Naravelia* by name. The geographical range is given quite fully, and is evidently the result of much care and correspondence.

Descriptions of Iowa Uromyces, by J. C. Arthur. From Bulletin Minn. Acad. Nat. Sci., Vol. II.

Some Algæ of Minnesota supposed to be Poisonous, by the same. l. c. The former paper is the result of a careful study of a portion of the American *Uredineaæ*, to which group the author has lately been paying special attention. The effort is most commendable to attract attention to plants too much neglected, and if ever the study of the lower Cryptogams ceases to be a bugbear, it will largely be due to just such workers as Prof. Arthur. The novel part about the present paper is that it attempts to group under each species all the three stages in its life history. Of course this is the thing to do, and it has only been because of our ignorance of the true relationship among these scattered phases, that it has not long since been done. A careful set of cultures is what is needed to unravel the snarl. In the meantime it has been customary to base species upon the characters of one or two phases, and to distribute the phases under separate genera, and Prof. Arthur shows considerable boldness in cutting loose from the old models, and attempting a natural grouping. The species number 12, one being new.

The second paper describes the discovery of some *Nostoc*, probably *Rivularia*, in certain Minnesota lakes, which was supposed to have caused the death of many cattle drinking their waters. These same "bur-balls" were found by the writer in great abundance in one of the small, swampy lakes along the Kankakee river in Jasper county, Ind. A large drove of cattle were drinking from it, but no ill-effects were heard of, although camping in the vicinity for a week gave abundant opportunity. These Algæ have already been noticed by Dr. Farlow in the May GAZETTE.

Lectures delivered to the Employes of the Baltimore and Ohio Railroad Company, by Drs. H. Newell Martin, H. Sewall, W. T. Sedgwick, and W. K. Brooks, of the Johns Hopkins University. Baltimore, 1882. 8°, 98 pp. Illust.

The marked success attending the delivery and distribution of these four lectures should prove an incentive to like undertakings elsewhere. The third lecture, on fermentation, by Dr. Sedgwick, is the only botanical one of the series. Botany has many topics of equal interest to a general audience, and ways might more frequently be devised to give those whose employment does not permit of much reading, and of no investigation, some insight into the more wonderful of the recent advances of science.

North American Fungi, by J. B. Ellis. Centuries X and XI. Newfield, 1883.

The continuance of this publication is a gratifying indication of the growing interest in this department of our science. Too great praise can not be bestowed upon the neatness and care, as well as the scientific accuracy with which the volumes are prepared, qualities which make the work indispensable to the investigator. In Century X the genera *Agaricus*, *Marasmius*, *Polyporus*, *Hydnum*, *Melanconium*, and *Peziza* are represented by from five to nine species each, while most of the other genera of the volume have but one representative. Century XI is composed of *Uredineæ*, excepting the last eleven examples, which belong to the *Ustilagineæ*. The determination and synonymy of this volume has been largely the work of Dr. W. G. Farlow, of Harvard University. The principal genera are *Puccinia* with thirty-six examples, *Æcidium* with twenty, *Ustilago* with nine, and *Peridermium*, *Uromyces* and *Roestelia* with six each. Some new species and changes of synonomy may be passed over for the present, as critical notes by Dr. Farlow will soon appear in the proceedings of the American Academy.

Catalogue of Publications of the Smithsonian Institution, with an Alphabetical Index of Articles, by W. J. Rhees. Washington, 1882. 8°. XIV, 328 pp.

This volume will prove very serviceable to all who desire information from or about the publications issued under the authority of the Institution. The classified list of separate works contains twenty entries under botany, while the general index has a large number of references to scattered articles.

Bentham and Hooker's Genera Plantarum, Vol. III, *Part 2*. This part contains the thirty-four orders of Monocotyledons, and completes one of the greatest botanical works of the century. No botanical library can afford to be without it any more than it can dispense with DeCandolle's Prodromus, and now the complete generic arrangement of a general herbarium becomes possible. Singularly enough the orders of Phanerogams number exactly 200. The Monocotyledons are divided into seven series, as follows, the orders mentioned being only those of our own flora:

Series I, characterized by its petaloid perianth, inferior ovary, and very small exalbuminous seeds, is called *Microspermæ*, and includes Hydrocharideæ, Burmanniaceæ, and Orchidaceæ.

Series II, differing from the former in its copious albumen, is named *Epigynæ*, and contains Bromeliaceæ, Hæmodoraceæ, Irideæ, Amaryllideæ, and Dioscoraceæ.

Series III differs from the last in its free ovary, and is called *Coronariæ*, containing Liliaceæ, Pontederiaceæ, Xyrideæ, and Commelinaceæ.

Series IV differs from the last in its small rigid calyx-like perianth, and is named *Calycinæ*, including Juncaceæ and Palmæ.

Series V has the perianth reduced to setæ or wanting, and is called *Nudifloræ*, including Typhaceæ, Aroideæ, and Lemnaceæ

Series VI has distinct carpels and exalbuminous seeds, and is called *Apocarpæ*, containing Alismaceæ and Naiadaceæ.

Series VII has flowers in heads or spikes and the parts glumaceous, of course called *Glumaceæ*, and containing Eriocauleæ, Cyperaceæ, and Gramineæ. Thus our flora contains 22 of the 34 orders. We can only make a few notes at random of the more striking changes.

Smilaceæ is made to rank only as a tribe under *Liliaceæ*. The genus *Anacharis* becomes *Elodea*. The family of Orchids seems to number the most species, containing nearly 5,000 species under 334 genera, the two largest genera being *Habenaria* and *Epidendrum*, each with 400 species. *Cyperaceæ* and *Gramineæ* come next in point of numbers, with *Liliaceæ* as fourth with 2,100 species and 187 genera, *Allium* being the largest with 250 species. Watson's *Oakesia* is returned to *Uvularia*. In the family of *Palmæ* there are about 1,100 species and 132 genera. It was with very great pleasure that we noted the dedication of a genus of palms to our good friend Mr. Sereno Watson, as distinguished among botanists as he is amiable among men. The genus is founded upon what is called *Sabal serrulata* in Chapman's Flora, and is called *Serenaæ*, as the name *Watsonia* was already in use for an African genus of the *Irideæ*. *Speirodela* has again been remanded to *Lemna*. Our authors are very strongly impressed with the idea that there are far too many species of *Cyperaceæ* and *Gramineæ*, giving it as their opinion that while among *Cyperaceæ* 3,000 species are described, scarcely 2,200 should be retained. *Cyperus* and *Carex* are the two largest genera of this family, the former containing 700 species, the latter 800, which Bentham and Hooker say should be reduced to 500. *Eleocharis* has become *Heleocharis*. Mr. Bentham's changes among the *Gramineæ* have already been pretty fully noted in advance in this journal, and with even greater particularity in the *Torrey Bulletin* for November, 1882. We must certainly give expression to the general sentiment among botanists when we say, that these most distinguished authors have placed the botanical world under an obligation which can hardly be expressed, much less repaid.

ARTICLES IN JOURNALS.

ANDREW, SALLIE L.—Insectivorous Plants (Petunia), *Pop. Sci. Mo.* 23. 382.
ARTHUR, J. C.—Descriptions of Iowa Uromyces, *Bull. Minn. Acad. Nat. Sci.* 2. 13; some Algæ of Minn., supposed to be poisonous, l. c. 2. 3.
CELAKOVSKY, L.—Some species of the genus Thymus, *Flora*, April 11, (concluded).
COOKE, M. C.—British Fresh Water Algæ exclusive of Desmidiaceæ, and Diatomaceæ, a review by Askenasy, *Bot. Zeit.* April 13; same reviewed by N. Wille, l. c.
ELLIS, J. B.—New N. Am. Fungi (10, all from Utah), *Torr. Bull.* 10. 52.
FISCHER, ALFRED.—Cell-division in Closterium, *Bot. Zeit.* April 13 (3 pl. continued), April 20 (3 pl.), April 27 (3 pl. concluded).
FRANKE, M.—Contribution to the Knowledge of Root-growths, reviewed by C. Müller, *Bot. Zeit.*, April 20.
GRAF, H. ZU SOLMS-LAUBACH.—Upon the occurrence of Cleistogamic flowers in the Pontederiaceæ, reviewed, *Bot. Zeit.* May 4.
GROVE, W. B.—Notes on Schizomycetes (being the conclusion of a translation of Dr. Winter's paper on this group in the last edition of Rabenhorst's "Kryptogamen-Flora)," *Sci. Gossip*, No. 222, 123.
HALBERLANDT.—The physiological action of plant tissues, reviewed, *Bot. Zeit.* April 20.
HANCE, H. F.—New Chinese Cyrtandreæ (8 species, including 2 new genera, Petrocodon and Primulina). *Jour. Bot.* 21. 165; Podophyllum a Formosan genus, l. c. 21. 174.
HARTIG, ROBERT.—Movements of Water in Plants, reviewed, *Bot. Zeit.* April 13.
HARVEY, F. L.—Arboreal Flora of Arkansas, *Am. Jour. Forestry*, 1. 413.
HECKEL, E.—Monograph of European Festucineæ, reviewed by Peter, *Bot. Zeit.*, May 11.
HOFFMAN, H. Culture investigations upon variation, *Bot. Zeit.*, April 27, May 4, May 11.
JAMES, JOSEPH F.—A Revision of the genus Clematis of the U. S., *Jour. Cin. Soc. Nat. Hist.* 6. July '83.
KARSTEN, P. A.—Mycological Fragments, *Hedw.* Feb. and March.
KIRSCHNER, O.—Upon the sensitiveness of the root-tip to the influence of gravitation, *Bot. Zeit.* April 27.
KRABBE, G.—Relation of bark-tension to the formation of annual rings and the diverting of the medullary rays, reviewed by Kienitz-Gerloff, *Bot. Zeit.* May 4.
KUEHN, J.—Review of his "Paipalopsis Irmischiæ, a new parasitic fungus of our flora," *Hedw.* Feb.
MEEHAN, THOS.—Observations on the variability of Quercus robur and remarks by A. De Candolle; reviewed by Peter, *Bot. Zeit.* April 27.
NORSTEDT, O.—Review of his "Fragments of a monograph of the Characeæ, by A. Braun," *Hedw.* Feb.
OUDEMANS, C. & J. A.—Two new fungi, *Hedw.* April.
PARRY, C. C.—Cucurbita Californica, Torr. (completing the character, with plate), *Torr. Bull.* 10.50.
PAX, FERD.—Flora of the Rehhorn near Schatzlar, *Flora*, April 21.
PENZIG, O.—Review of his "Fungi Agrumicoli," with descriptions of new species, *Hedw.* March and April.
PHILLIPS, WM.—Review of his "Revision of the genus Vibrissea," *Hedw.* Feb.
PRANTL, K.—The Genera Cryptogamme and Pellæa of Ferns, reviewed by Dr. L. Klein, *Bot. Zeit* May 11.
REHM, DR.—Ascomycetes, Fasc. XIV. (descriptions of species), *Hedw.* March and April.
REINSCH, P. F.—Further observations upon the peculiar intercellular bodies of coal, *Flora*, April 21.
RICHTER, P.—Additional notes upon Sphærozyga Jacobi, *Hedw.* Jan.
SACCARDO, P. A.—Remarks upon the carpological system of the Pyrenomycetes, *Hedw.* Jan.
SATTER, HANS.—Contributions to the History of the development of the antheridium in Hepaticæ, reviewed by Kienitz-Gerloff, *Bot. Zeit.* April 27.
SAUNDERS, JAMES.—A plea for our Charas, *Sci. Gossip*, No. 222. 121.
SCHULZER, STEPHAN, VON MUEGGENBURG.—Contribution to the morphology of Fungi, *Hedw.* April.
SCHWEINFURTH, G.—The Flora of Ancient Egypt (an account of the funeral wreaths belonging to Ramses II., Amenhotep I., and Aahmes I.), *Nature*, 28. 109.
SPRUCE, RICHARD.—A review of his memoir upon "Cephalozia (a genus of Hepaticæ), its subgenera, and some allied genera," *Jour. Bot.* 21. 183.
STEPHANI, F.—Some new Hepaticæ, *Hedw.* April.
STROBL, P. GABRIEL.—Flora of Nebrodem (cont. from Flora 1882, p. 553), *Flora*, April 11 and May 1.
TREFFNER, ED.—Contributions to the chemistry of Mosses, reviewed by Kienitz-Gerloff. *Bot. Zeit.* May 11.
TRELEASE, WM.—The color-preferences of the Hive-bee, *Science*, 1. 305.
VASEY, GEO.—New species of Grasses, *Torr. Bull.* 10.52.
VELENOVSKY, J.—Inflorescence of Drosera rotundifolia, *Flora*, April 11.
WINTER, G.—Some new Fungi (including 3 U. S. species), *Hedw.* Jan.; upon the genus Harknessia, *Hedw.* Feb.; New N. Am. Fungi (4 from Ky., 1 from Ill.), *Torr. Bull.* 10. 49.

BOTANICAL GAZETTE.

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Some North American Botanists.

VIII. JOHN LEONARD RIDDELL.

There is little on record concerning the personal history of Professor Riddell. He early became a resident of the West, where, with the exception of an acquaintance with Sullivant, and possibly with Short, he was in almost complete isolation from the botanists of the time. He subsequently took up his residence in the South, where his botanical acquaintances, and the opportunities for reference and consultation seem to have been even less than in the West. The South and West of fifty years ago presented little opportunity for study aside from their comparatively unexplored floras.

John Leonard Riddell was born in Leyden, Massachusetts, February 20, 1807. He died in New Orleans October 7, 1865. When less than a year old he was taken by his parents to Preston, Chenango county, New York, where his father obtained a farm. During portions of the years 1826 and 1827 he attended Oxford Academy, and afterwards the Rensselaer School at Troy, where he obtained the degrees of A. B., and A. M. For several years from 1830 he gave lectures on various scientific topics in many places in the United States and Canada. These lectures attracted some attention, and in 1835 he received the appointment of Adjunct Professor of Chemistry and Lecturer on Botany in the Cincinnati Medical College. This institution subsequently gave him the degree of M. D. While at Cincinnati he published a "Synopsis of the Flora of the Western States," a 12mo pamphlet of 116 pages, enumerating the plants known to occur in the territory which "extends from the Alleghany mountains in West Virginia to the Platte river in Missouri Territory, and from the southern boundary line of Tennessee to the latitude of Detroit." This catalogue was in great part a compilation. The Kentucky plants were given almost entirely upon the authority of Dr. Short, those about St. Louis upon the authority of Dr. Lewis C.

Beck, who had contributed considerably to the knowledge of the plants of that vicinity through *Silliman's Journal*, while the collections of Nuttall were relied upon for the Missouri Territory It enumerates over 1,800 species, and gives notes on habits of growth and localities. This catalogue was the first contribution of much importance devoted entirely to the Western flora. The following extract from the preface will explain the design of the work: "It has for several years been the author's design to publish a flora of the Western States when he shall have accumulated a sufficiency of materials; and he takes this opportunity of soliciting information from those who may choose to favor him with their correspondence, and of proposing an interchange of botanical specimens with all who may wish to form collections. The following catalogue, though necessarily incomplete, will probably aid in effecting the desired object, by exhibiting its present state of advancement, thereby enabling observers located in different sections of the assumed territory the more easily to make additions to it." The catalogue contains descriptions of thirteen new species of flowering plants, and two or three Charas. Of these, two stand in our manuals, *Solidago Ohioensis* and *Trillium nivale*. It also contains a description of *Solidago Riddellii*, so named by Dr. Joseph C. Frank, "a most zealous and accomplished botanist," author of "Rastadts Flora," and who was deputed by some German society to travel in this country and make botanical collections. Dr. Frank became intimate with Riddell, and spent some time with him in Cincinnati before he set out on his botanical journeys. During his stay in that city he interested himself in grasses and sedges, a work commemorated in *Eragrostis Frankii*. In 1835 Dr. Frank fell a victim to yellow fever in New Orleans.

In 1836 Dr. Riddell published a "Supplementary Catalogue of Ohio Plants," which contains descriptions of seven new species, of which four still stand,—*Linum sulcatum, Helianthus occidentalis, Scutellaria saxatalis* and *Stachys cordata*. That year he was elected to the chair of Chemistry in the Medical College of Louisiana at New Orleans, an institution which subsequently became the Medical Department of the University of Louisiana. This chair he occupied until his death. With his move to the South he seems to have given up his Western flora. He at once began to collect materials for a flora of the Southern States, however, a work which seems to have been constantly postponed on account of a multiplicity of other duties. His herbarium, upon which this work was to have been founded, is said to have been very large and excellently arranged. In 1851 Dr. Riddell con-

tributed to the Smithsonian Institution a manuscript on "The Plants of Louisiana." In this contribution he was aided by Prof. W. M. Carpenter and by Dr. Josiah Hale, who contributed the *Cypreaceæ* and *Gramineæ*. The Smithsonian did not publish the contribution, and Riddell made an abridgement of it under the title of "Catalogus Floræ Ludovicianæ" for the *New Orleans Medical and Surgical Journal*, which published it in 1852. The manuscript catalogue contained descriptions of new species by Prof. Carpenter, and twenty-one species and several varieties by Riddell. The manuscript or the subsequently printed catalogue seem not to have been consulted by Dr. Chapman in his Southern Flora, although *Dicliptera Halei*, one of Riddell's new species, is inserted.

While residing in New Orleans, Dr. Riddell was for some years connected with the government mint. He published in 1845 a "Monograph of the Dollar," a work containing fac simile impressions of between five and six hundred kinds of United States and Mexican dollars, both genuine and counterfeit. During the latter part of his life he did much work with the compound microscope, investigating extensively the lower forms of life, and inventing the binocular microscope. As early as 1836 he published in Cincinnati a paper on "Miasm and Contagion," in which he advocated that contagious diseases are caused by "organized and living corpuscles of various kinds." This contribution became popular, and was republished in Boston. He also contributed considerably to the scientific journals on matters relating to chemistry and other topics.

Dr. Riddell is said to have been a universal favorite with all who knew him. His students regarded him with adoration. He was a clear, concise lecturer, and a logical thinker. His business abilities were extraordinarily good, and he amassed a handsome property. His name is indelibly associated with botany through the genus *Riddellia*, a name which Nuttall gave to a western Composite. The original species, *R. tagetina*, has been supplemented more recently by *R. Cooperi* and *R. arachnoidea*, both added by Dr. Gray.—L. H. BAILEY, JR.

Notes on Some Ustilagineæ of the United States.

The study of the *Ustilagineæ* is beset with difficulties, for not only do the species themselves present comparatively few salient points of distinction, but the generic characters as estimated by recent writers depend largely upon the mode of germination of

the spores. A perusal of the admirable paper of Woronin, *Beitrag zur Kenntniss der Ustilagineen*, shows how large a part the germination plays in the limitation of the genera, and when one bears in mind how little is known of the germination of our native species, he will understand how imperfect the classification of our *Ustilagineæ* must be. In the present article I would like to call attention to some of our little known forms, without pretending to regard my determination of the species as anything more than provisional, expecting that increased knowledge of the development, which it is to be hoped we shall soon have, will necessitate a reform in the nomenclature.

The genus *Entyloma*, founded by DeBary on *Protomyces microsporus*, Unger, includes a comparatively small number of species, in which the small mycelium inhabits the leaves of different herbaceous plants, and where the spores are formed in the continuity of the hyphæ, usually in large numbers, but do not become pulverulent as in most *Ustilagineæ*. The germination of the spores resembles that known in species of *Tilletia*; a short germinal tube is given off, at whose apex is borne a whorl of short cells which unite with one another in pairs. In some of the species of *Entyloma*, besides the spores in the interior of the leaves, there are conidia borne on stalks which penetrate the stomata in dense tufts and form white pulverulent spots on the leaves. Schrœter makes two divisions of the genus according as the species bear conidia or not. The spores of the greater number of species of this genus are very nearly alike in size and shape, being oval or somewhat angular, and in most cases it is not easy to define the species by the spores alone. The presence or absence of conidia, it seems to me, can hardly be regarded as constant in all cases, for, as in the form on *Ambrosia*, the conidia are sometimes present, but more frequently they are wanting. The conidia are usually like the forms referred to the genera *Fusidium*, *Cylindrospora* or *Ramularia* and, in the case of our species, it may be that the conidial forms have already been described as species of the genera above named, without reference to the spores in the interior of the leaves; but if such is the case I have been unable to trace them.

The type of the genus belonging to the division in which there are no conidia is *Ent. microsporum* (Unger), DeBary, which has been found by Prof. Arthur on *Ranunculus repens* near Chicago, but, although I have often searched for it, I have never found it near Cambridge. Another species found on *Ranunculus* in Europe, which has no conidia, *Ent. Ranunculi* (Bon.), I have never

found in this country, but a form found on *Thalictrum dioicum* in Wisconsin, by Prof. Wm. Trelease, is very nearly related to *Ent. Ranunculi*, although it would be going too far, at present, to call the two identical. The fungus on *Thalictrum* produces on the leaves rather small circular spots, which are at first yellow and later black. On the specimens which I have examined the conidia were not in very good condition, and it would be necessary to examine more mature specimens before expressing a decided opinion on the species. The conidia were in small patches on the under surface of the leaves, and the conidial-spores were linear, acute, 11-20 μ long by about 3 μ broad. The spores were abundant in the interior of the leaves, but hardly mature, and measured 9 12 μ in diameter.

The most common *Entyloma*, at least in the east, is one which occurs on *Compositæ*. Several years ago, when looking for the oospores of *Peronospora Halstedii* on *Ambrosia artemisiæfolia*, I repeatedly found bodies which were evidently not the desired oospores, although the *Peronospora* was growing on the leaves, but rather the spores of an *Entyloma*. Since then I have found specimens on *Ambrosia* with conidia as well as deep-seated spores, and what is evidently the same fungus was found in a luxuriant condition on *Aster puniceus* at Wood's Holl by Trelease. I have since repeatedly found the fungus on *Ambrosia* and *Aster* in small quantities, and it was abundant on *Aster puniceus*, growing at the top of Tuckerman's ravine on Mt. Washington, in September, 1882. On *Ambrosia* the fungus causes yellowish or grayish discolorations of indefinite shape, which become eventually black. On *Aster* the spots are more circumscribed and, although generally yellow, they sometimes have a purple border and the leaves become slightly thickened, which is not the case when it grows on *Ambrosia*. The conidia form farinaceous spots on the under surface of the leaves, which they sometimes almost cover. The determination of our species is doubtful. Several *Entylomata* are known on *Compositæ*. *Ent. Calendulæ* (Oudemans) and *Ent. Picridis*, Rostrup, of Europe, are said to be destitute of conidia and, if we accept the statement as absolute, our form must be different. The spores of our *Entyloma* average about 7.5-11.5 μ, while those of *Ent. Calendulæ* are often from 11-15 μ in diameter. Of *Ent. Picridis* I have examined only the specimen in Myc. Univ. No. 1815, in which the measurements more nearly resemble those of our own species. Of previously described American forms there is a *Protomyces polyspora*, Peck, in Myc. Univ. No. 1813, on *Ambrosia trifida* from New York. In my specimen there are no conidia nor are

any mentioned in the description. The species is an *Entyloma* rather than a *Protomyces*, as that genus is now limited. The spores are much like those of the form on *Ambrosia artemisiæfolia* and *Aster*, differing only in being somewhat darker and more angular, but the specimen of Peck was collected later in the season than any of my specimens. The conidial spores of my specimens are fusiform or slightly clavate, often somewhat curved, and measure 15-20 μ by 2-3 μ. They sometimes appear to be divided, but on this point I am not certain. I would propose the provisional name of *Entyloma Compositarum*, while awaiting further information with regard to the occurrence of conidia in the European *Ent. Picridis* and its relation to *Ent. Calendulæ*. I am inclined to believe that *Ent. Compositarum* may prove to be a more fully developed form of *Ent. polysporum* (Peck), the relationship of which to *Ent. Picridis* needs further study, for, although as distributed in Myc. Univ., the two have a different aspect, I am not so sure that one is not an earlier and the other a more mature form of the same species.

Besides *Ent. Compositarum*, I have examined three other species of the genus which are new to the United States. Prof. Bessey, to whom we owe so many interesting discoveries of *Ustilagineæ*, sent me an *Entyloma* collected in September, 1878, on leaves of *Solanum* or *Physalis* in Iowa, and later I received from Prof. Arthur the same fungus on *Physalis*, also from Iowa. In both cases there were abundant conidia and spores. The conidia are at first short but become long and filiform, measuring from 20-45 μ by 1.5-3 μ. Contrary to what is found in most species, the conidia on *Physalis* occur on both surfaces of the leaves in circumscribed round spots, which are at first pale but soon become black. The spores are yellowish or slightly brown when mature, generally globose, on an average 12-15 μ in diameter, and the surface, although sometimes smooth, is often slightly undulate. There is already a *Protomyces physalidis* Kalch. & Cooke, on *P. Hornemanni* from South Africa, described in *Grevillea*, vol. IX, p. 22, Sept., 1880 It may be that this is the same as the fungus from Iowa, but as no conidia are described in the African species, our species may be called provisionally *Entyloma Besseyi*.

Two other species have abundant conidia as well as spores. One was discovered on the leaves of *Menispermum Canadense*, in Wisconsin, by Prof. Trelease, in August, 1881, and the other on *Lobelia inflata* was collected by me at Gilead, Maine, in September, 1882. As far as I can ascertain, both species are undescribed, although in the case of the one on *Menispermum*, it seems

hardly probable that the striking conidia could have escaped the notice of earlier collectors. *Entyloma Menispermi* produces dark, ill-defined discolorations on the upper surface of the leaves, which are not thickened by the presence of the fungus. The conidia form conspicuous, farinaceous, polygonal patches on the under surface of the leaves, which they sometimes nearly cover. The conidial stalks are more loosely branched than in the previously mentioned species and the conidial spores are stouter and pointed at one end, measuring 11-24 μ by 3.5-4 μ. The spores are globose and smooth with thin walls, about 5.5-11 μ in diameter.

Entyloma Lobeliæ produces no marked distortions of the leaves, but the plants infested have a whitish color, looking as if they were attacked by some member of the *Perisporiaceæ*. Ill defined yellowish spots are formed on the upper side of the leaves, and gradually the whole leaf blackens and shrivels. The conidia, although very abundant on the under side of the leaves, are not so distinctly characterized under the microscope as those of the last species. They are narrowly fusiform and measure 10-25 μ by 2-3 μ. The spores are larger than in *Ent. Menispermi*, but smaller and decidedly more delicate than in *Ent. Besseyi*.

The species above mentioned may be summarized as follows:

A. *Species destitute of conidia.*

1. ENT. MICROSPORUM (Ung.) DeBary.
On *Ranunculus repens*. Near Chicago. Prof. J. C. Arthur.
2. ENT. POLYSPORUM (Peck).
On *Ambrosia trifida*. New York.
3. ENT. LINARIÆ (Schrt.)
On *Veronica peregrina*. Wisconsin. Trelease.

B. *Species with conidia.*

4. ENT. COMPOSITARUM Farlow ad int.
Conidia fusiform or slightly clavate, often curved, 15-20 u long by 2-3 u broad. Spores globose or somewhat angular, about 7.5-11.5 u in diameter, wall thin and nearly colorless.
On *Aster puniceus* and *Ambrosia artemisiæfolia*. New England.
5. ENT. BESSEYI Farlow ad int.
Conidia rod-shaped, becoming filiform, 20-45 u long by 1.5-3 u broad. Spores globose, 7.5-15.5 u in diameter, average 12-15 u, yellowish brown, thick walled, surface smooth or undulate.
On *Physalis*. Iowa. Profs. Bessey and Arthur.
6. ENT. MENISPERMI Farlow and Trelease.
Conidia acutely ovate, 11-24 u by 3.5-4 u. Spores light colored, globose or somewhat angular, smooth, with thin walls, about 5.5-11 u in diameter.
On *Menispermum Canadense*. Wisconsin. Prof. Trelease.
7. ENT. LOBELIÆ Farlow.
Conidia narrowly fusiform, 10-25 u by 2-3 u. Spores light-colored, globose or slightly angular, thin-walled, 8-15 u in diameter, average 7.5-11.5 u.
On *Lobelia inflata*. Gilead, Maine.
?8. ENT. RANUNCULI (Bon.)
forma *Thalictri*.
On *Thalictrum dioicum*. Wisconsin. Trelease.

In connection with the species of *Entyloma* previously mentioned, I would add that *Protomyces Sagittariæ*, Fuckel, a species whose systematic position is not well known, was found by me growing on *Sagittaria variabilis*, Engelm., at Newton, Mass., in the month of October. I am indebted to Prof. DeBary for an authentic specimen of Fuckel. I received from Mr. J. Fletcher, of Ottawa, some fruit of *Potamogeton Vaseyi*, Robbins, attacked by a very curious fungus. The specimens had been preserved in alcohol and consequently there was no possibility of making the spores germinate. The fruit of the *Potamogeton* was swollen and a section showed globular masses scattered through the substance of the fruit. The masses consisted of densely packed cells, the outer layer of which was darker colored than the rest and regularly arranged, so that the cells, which had the shape of short cylinders with rounded ends, had their longer axis always in the direction of the radius. Beneath this regularly arranged layer the cells were roundish-angular and presented the appearance of parenchymatous cells. Having but little material at my disposal I was unable to study the fungus at all satisfactorily, but it appeared to me to be probably one of the *Ustilagineæ*, related perhaps to *Sorosporium* or *Thecaphora*. My friend, Dr. Maxime Cornu, of Paris, has expressed the opinion that the fungus in question belongs to a genus recently described by him under the name of *Doassansia*. As the description of the genus has not yet reached this country, I can give no further information, but would call the attention of collectors of *Potamogeton* to the existence of this curious fungus of which more material is much needed. The fungus occurs also on *P. pusillus*, *P. perfoliatus*, var. *lanceolatus*, and *P. natans*, according to Mr. Fletcher, whose description of the diseased fruit, when freshly gathered, I quote for the benefit of collectors of aquatic plants:

"The fruit was swelled out to more than four times its proper size and was almost globular, of a greenish white color, spotted with reddish-brown—later these fruits cracked and then the whole soon decayed and a white mouldy growth was developed."

While collecting in King's ravine in the White mountains, in August, 1882, I found a curious fungus on *Epilobium alpinum* growing on the borders of the torrent which falls from Mt. Adams to the floor of the ravine. The *Epilobium* was infested with *Æcidium Epilobii*, D. C., and on some of the leaves were dark-colored spots which I, at the time, supposed to belong to *Puccinia Epilobii*, D. C. A microscopic examination showed that the fungus was one of the *Ustilagineæ* and very closely re-

lated to *Doassansia Alismatis*, Cornu, for an authentic specimen of which I am indebted to the author of the species. The fungus appears to the naked eye in the form of blackish convex nodules about the size of a pin's head, which are collected in groups, especially at the apex of the leaves, and visible on both sides of the leaves. The nodules consist of densely packed roundish-angular spores, those on the outside being dark colored and those within lighter colored. The masses are surrounded by a fine mycelium, but the development of the spores and their germination could not be studied from the material which I collected and, owing to the remoteness of the locality, it will be difficult for future collectors to find the spot where my specimens were collected. It is not impossible that the fungus has been described by some older writer, but I have not been able to find any trace of it. To mark the species it may be named temporarily *Doassansia Epilobii*.

DOASSANSIA EPILOBII Farlow ad int. Spores densely packed in globular or lobulated masses which are 80-200 μ in diameter. Spores irregularly polyedral, approaching globular, 7.5-17 μ in diameter, average 10-12; external spores blackish-brown, thick-walled, outer surface cuticularized; internal spores lighter colored with thinner walls.

Thecaphora aterrima, Tul., was found several years ago by Prof. Bessey, on *Carex*, in Iowa. Collectors should search for this interesting species in the Eastern States. *Ustilago Sorghi* (Lk.) has been received from Dr. Taylor, of the Agricultural Department in Washington, where it was found growing on cane grown from seed imported from China, and it has also been found by Prof. Trelease, on amber-cane in Wisconsin. *Ustilago Gynerii.*, Vize, of which I have examined specimens presented to me by Dr. Harkness, is the same as *Gymnosporium Arundinis*, Corda, and is to be excluded from *Ustilagineæ*. *Tilletia striæformis*, West. (*Till. DeBaryana*) was found by Mr. B. D. Halsted on an unknown grass at Passaic, N. J., and by Mr. A. B. Seymour at Granville, Mass. A curious form has been found by Prof. Bessey on leaves of *Polygonum* (*P. Pennsylvanicum?*), at Ames, Iowa. The fungus forms purple spots on the leaves, and the spores are borne in projecting pustules nearly black in color and hard instead of pulverulent. The flowers are also affected by what seems to be the same fungus, and I have received from Mr. Halsted flowers similarly affected, from New Jersey, but he did not find the fungus on the leaves. The formation of the spores shows that the fungus is an *Ustilago*, and regarding the

fungus on the leaves alone, it would appear to be the *Tilletia bullata* of Fuckel, referred by Schroeter in Cohn's *Beit. zur Biol.*, vol. II, p. 355, to *Ust. Bistortarum* (D. C.). Prof. Bessey's specimens on leaves agree well with Schroeter's description. A question may arise as to the species when we consider its appearance on the flowers. In *Ust. Candollei*, Tul., closely related to *Ust. Bistortarum*, the ovaries are distorted so that they project like columns from the perianth, but in the specimens collected both by Prof. Bessey and Mr. Halsted, the distortion is still greater. The ovaries are all transformed into more or less globular hard masses and, as nearly all the flowers of a spike are affected, the masses coalesce, forming a compact cylinder with a nodulated surface in which the individual flowers can hardly be recognized. The color of the spores, both in the form on the flowers as well as that on the leaves, is hardly purple but more nearly brownish than in *Ust. Candollei.* While referring the species to *Ust Bistortarum* (D. C.), it will be seen that there are several points in which the American plant does not exactly agree with the European form. The form on the leaves, I would add, is much like Libert Plant. Crypt. Ard., No. 88.

W. G. Farlow.

"Thistledown."[1]

A STUDY.

As a child, have you not held gently poised twixt thumb and finger the airy, fleecy thistledown, then lightly blowing watched the tiny parachute as it sailed away? It is a delicate, cunning device, lighter and more buoyant than a bird's feather, smaller and finer than the moth's antennæ.

When separated from the achene, it consists of plumelike filaments attached to a ring. Its mode of attachment to the seed is peculiar. The upper end of the achene is grooved, thus leaving a small projecting edge of the calyx. Into this groove fits a minute ring—large enough to slip upon a common pin. The pappus is attached to the lower edge of this ring, while over the upper edge fits the corolla and its adhering stamens. The end of the achene—inside the groove—is elongated and to this is attached the pistil.

[1] From the "*Aurora*" for May, a journal conducted by the students of the Iowa Agricultural College. Miss Knapp is a special student in botany, and in this article gives us a glimpse of the kind of work done by Professor Bessey's pupils.—Eds.

Microscopically each filament consists of eight or ten rows of very long parallel cells. On the margins are seen the outward pointed tips of newly developing cells.

A fully grown pappus measures about 25 m. m.; that of a head not yet opened about one-half this length, while one partly opened is three-fourths.

Is the mode of growth by multiplication or by the elongation of the cells? It must be by elongation, for, on measuring the cells of the unopened head, they are found to be only one-half as long as those of the fully grown pappus. The cells of the latter are about one thirty-sixth of an inch or of the entire length.

Besides the change in the cells of the main portion, the marginal ones, which in the very young heads appear as barbs, become greatly lengthened and thus give the plumose or feathery appearance to the pappus

But this elongation is not the only thing that takes place in its development. Each filament, by some action, bends backward until the pappus stands in all directions around the achene.

In order to determine the manner of this action I tried the following simple experiments:

I put on the stove an achene which had not yet fully opened, and therefore had the pappus still adhering. After a moment the pappus began to separate and curve back, the movement showing particularly at the base where it joins the little ring, the marginal cells, also separated, standing out like the vanes of a feather. The whole took about one-half minute, the movements being quick and rather jerking.

Taking the same specimen in which the pappus was now all bent over the achene, I applied a small hair brush, wet in water, to the top of the achene so that the basal cells would be moistened first. These cells began to draw closer to the ring, slowly bringing the pappus from its recumbent position.

Again, upon moistening a piece of dried pappus with alcohol and potash, the marginal cells drew quickly toward the main portion.

Afterwards, in studying specimens of *Mulgedium* and *Lactuca*, I found that the pappus was joined to the achene by two or three rows of small square cells.

From these facts it would seem evident that the lower surface is more susceptible to heat or moisture, contracting in the presence of the latter, and swelling again in the presence of the former; but mainly this movement is due to the small square cells, for by their contraction the pappus moves downward.

On account of this Prof. Bessey proposes for them collectively the name "Carpus," and individually that of "Carpallary cells," because the relation they bear functionally to the pappus is so nearly like that of the carpus to the phalanges.

I would also suggest that the little ring spoken of is a portion of the calyx, for all the species of *Lactuca* examined have a beak or projection to the calyx. This is wanting in the Thistle, or rather has been reduced to a rudimentary form in the shape of this minute ring.

The "Thistledown" or pappus treated of in this article is simply that of *Cnicus altissimus*—our common purple thistle; but its form is characteristic of the genus *Cnicus*. Formerly thistles were placed under *Cirsium*, and *Cnicus* was called a sub-genus, but Bentham and Hooker, in their "Genera Plantarum" have made two distinct genera, taking the different forms of pappus as the ground of distinction. *Cirsium* contains those thistles having barbed pappus, or like the early stage which I have described, while *Cnicus*, or the true thistles, have plumose pappus. —MINNIE KNAPP, Ames, Iowa.

GENERAL NOTES.

The Fig and the Caprifig.—The relation existing between the wild and cultivated figs has long been a puzzle, and has been variously explained. Graf Solms considers them as two races under one species. Gasparrini describes them as distinct genera. Fritz Müller thinks they are simply male and female plants, and to this view botanists are inclining. The fact that the presence of the caprifig was needed for the best development of the fig, and that the former was inhabited by an insect which visited the latter if possible, has long been known. The operations of this insect are very interesting, and are given in *Nature*, by W. B. Hemsley, as follows:

"The insect that operates in this manner is a small hymenopter, the complete annual cycle of development of which takes place within the three crops of fruit of the caprifig, whilst only one generation visits the fig, and that, as will be seen, to no advantage to the insect itself. In order to render what follows easily understood, we will give the present Neapolitan names of the three crops of the caprifig. The fruits that hang through the winter and ripen in April are called *mamme*. These are followed by the *profichi*, which ripen in June, and the *mammoni*, which ripen in August and September. If we closely examine the *profichi* when fully ripe in June, we see here and there a black-winged insect emerging from the orifice at the top, its hairy body dusted over with pollen grains that have adhered to it in its passage through the zone of male flowers. And if we cut open one of these fruits, we find a considerable number of

these insects, all striving to find the way out. These are females, and associated with them are some helpless wingless males, and very often a number of a slender ichneumon as well. The female of this generation visits not only the *mammoni*, but also the fruits of the fig, if there are any at hand, in order to deposit her eggs. Now, the remarkable fact in connection with this, is that she is able to do so effectually in the *mammoni*, but not in the edible fig, though she succeeds in penetrating the fruit far enough to convey pollen to the female flowers, perishing in the act. Furthermore, the generation of the insect that develops in the *mammoni* deposits eggs in the *mamme*, and the generation proceeding therefrom finds an asylum for its progeny in the *proficki*."

Prof. Solms says that the eggs must be deposited within the integuments of the ovule itself, or they will not develop. The ovipositor is thrust between the branches of the stigma, down the pollen channel of the style into the ovary, and into the solitary ovule itself.

Classification of Plants.—Mr. Lester F. Ward, in a recent lecture at the National Museum in Washington, proposed the following scheme of classification, which he claims is the nearest approach yet made to a natural system, and upholds it mostly upon paleontological grounds:

- Cryptogams
  - Cellular.
  - Vascular
    - Filicineæ
      - Filices.
      - Rhizocarpeæ.
    - Lepidophytæ
      - Equisetineæ.
      - Lycopodineæ.
      - Ligulatæ.
- Phenogams
  - Gymnosperms
    - Cycadaceæ.
    - Coniferæ.
    - Gnetaceæ.
  - Angiosperms
    - Monocotyledons.
    - Dicotyledons
      - Apetalæ.
      - Polypetalæ.
      - Gamopetalæ.

The Effects of Moisture on Pine.[1]—Ten pieces one inch square by ten long were selected from a piece of pattern pine that had been "in the dry" for six or seven years. Inasmuch as this is the driest class of commercial pine, the results are more satisfactory and conclusive. The pieces were numbered consecutively, and two were taken for each experiment to obtain a mean result, and avoid error as much as possible. Nos. 1 and 2 were placed in a drying oven in the chemical laboratory, and kept at a temperature of 100° C. Nos. 3 and 4 were placed in moist air; and Nos. 5 and 6 immersed in water. Nos. 7 and 8 were exposed to the ordinary atmospheric changes. Nos. 9 and 10 were made into shavings, and placed in the oven for perfect drying. Each piece was carefully weighed and measured once in twenty-four hours. (Experiment lasted 14 days). The average weight of each piece at the beginning of the experiment was 63 grams, or 6.3 grams per cubic inch. The tabulated results show: I. That there was a marked difference in the weight of some of the pieces, those being heavier that were situated near the center of the tree. II.

[1]Abstract of a paper read before the Scientific Society of Purdue University, by Philip S. Fitzgerald, class of '85.

that the dried blocks (1 and 2) had lost 9.5 % of their original weight. III. That the moist air blocks (3 and 4) had gained 3.9 % in weight. IV. That the wet pieces (5 and 6) had absorbed 62.25 % of their own weight of water. V. That the ordinary air pieces (7 and 8) had undergone practically no change. VI. That the shavings (9 and 10) had lost only 7.9 %, or less than the blocks 1 and 2. VII. That the increase and decrease in width was very much more marked in the direction of the annual rings than in the direction of the medullary rays. VIII. That the greatest increase in width was $\frac{1}{16}$ of an inch, which was from *fifty to sixty times greater* than the increase in length; and IX. That the increase in size was not proportional to the gain in weight.

Rhododendron (Azalea) Vaseyi, Gray in Proc. Am. Acad., xv, 48. 1879.—Having been favored with notes upon the living plants and both flowering and fruiting specimens of this interesting shrub, from my obliging friends Mr. Canby and Mr. J. Donnell Smith—the latter sending abundant specimens both of this year's blossoms and of last year's fruiting—I propose to amend the published character, which was drawn up from young Mr. Vasey's original specimens.

First, as to the flower buds. I described these as with "*perulis paucis*," but summer specimens with formed flower buds for the next year have well imbricated bud-scales. The outer and shorter bracts fall as the bud opens, the thin innermost remaining longer, which led to the mistake. Maximowicz makes a similar mistake in respect to *R. Rhodora.*

Next, the blossoming is precocious rather than coëtaneous with the leafing. Vasey's specimens, with flowers ready to fall, have leaves an inch and a half long. Those sent by Mr. Smith, which were gathered at the middle of May by Mr. S. Kelsey, are either leafless, or the more advanced plants just developing a pair of leafy branches from just under the flowering bud.

In the third place, the corolla is irregular in a bilabiate way, thus confirming its relationship to *R. Rhodora*, however different in habit. Maximowicz takes notice of this bilabiation in two N. E. Asiatic species. It is 5-parted or nearly, but the lateral sinuses are deeper, and three of the divisions more connected than the other two. Mr. Canby notes that the three divisions of what may be called one lip, are shorter than the other two, and so it is in a corolla received from him; but in numerous dried specimens this is not so apparent. But the *spread* of the divisions is decidedly irregular, three seemingly ascending and two recurved-spreading. The upper corolla-lobes are more or less spotted inside toward the base; in some flowers the spots are dark and conspicuous.

In the fourth place, the stamens are prevailingly seven, quite unequal, three or four of them larger and with stouter filaments. I had described them as five, and this is true of some flowers. In one flower I find only four, three large and one depauperate. The ovary is beset with stipitate viscid glands. I had described the capsule as glabrate (not glabrous), which is not far out, but it is roughish with the vestiges of the bristly glands. Mature leaves are from obovate-oblong to oblong-lanceolate, acute or acuminate at both ends, the larger four to six inches long. A. GRAY.

Notes from California.—1. The rare *Streptanthus heterophyllus* ranges from Temecula Cañon to San Rafael, Mexico.

2. There are all sorts of transitions between *Lepidium Menziesii* and *L. lasiocarpum*, and as Watson has united *lasiocarpum* and *Wrightii*, it is probable that this will follow. The number of stamens varies from two to four in each, while the flattened pedicels vanish, and the pods are smooth or pubescent.

3. *Lepidium nitidum* ranges throughout S. California and N. Mexico. The seeds hang from the base of the style.

4. *L. dictyotum* and the var. *acutidens* occur on the Tamecula plains, and the latter also at San Diego. The typical form has been supposed before to be confined to central Nevada, and the variety was not known from S. California.

5. I have three forms of *Thysanocarpus curvipes*; *a.* Leaves runcinate, stamens conspicuously exserted, petals not surpassing the sepals, auricles short or almost none, pods rounded. *b.* Leaves lyrate, auricles long, pods obtusely pointed, stamens and petals as in *a.* *c.* Stamens short, petals surpassing the sepals, leaves lyrate. All these forms have the peculiar hairs of *T. curvipes.*

6. *Thalictrum Fendleri* grows in Temecula Cañon.

7. A peculiar form of *Clematis ligusticifolia* abounds north of San Francisco, having both perfect anthers and sterile filaments on the pistillate plant, thus making it perfect. The leaves differ somewhat also, but Mr. Watson regards it as *C. ligusticifolia.*

8. *Viola pedunculata* ranges throughout S. California into Mexico as far as Eucenada.

9. *Rhamnus croceus* varies much. The stamens are oval to oblong; calyx lobes lanceolate, acute; petals sometimes wanting.

10. The horns of *Ceanothus crassifolia* are broadly ovate and very short, while those of *C. cuneatus* are often linear.

11. The petals of *Cneoridium dumosum* are four times as long as the calyx. This hitherto rare plant, along with *Adolphia Californica*, one equally rare, ranges south along the coast to Eucenada, Mexico. The latter is much more common further south.

12. *Astragalus tener* is now to be found in S. California at Soledad, near San Diego.

13. The coast plant *Boykinia occidentalis* is not uncommon in the Sierras at Emigrant Gap.

14. *Psoralea physodes* is abundant in the mountains at Los Angeles.

15. *Hosackia decumbens*, var. *Nevadensis*, is not annual and has no claim to exist as a variety, as the characters given do not hold good.

16. *Hosackia maritima* is either pubescent or smooth, and even fleshy, and extends far into Lower California.

17. The leaflets of *Vicia Americana*, var. *truncata*, are often deeply emarginate.

18. *Sambucus bipinnatifida* ranges south at least to Eucenada, Mexico.

MARCUS E. JONES, *Salt Lake City.*

Galinsoga parviflora, a nettle-like Composite from S. America, is abundant and fully established along the streets and in neglected gardens near Union Park, in Chicago.—J. C. A.

Notelets.—It is well known that the milkweeds (*Asclepias*) often catch insects in their flowers. In the Botanic Garden at Cambridge I have frequently seen small moths hanging by their proboscides to certain foreign Asclepiads. The other day I found our common little red butterfly (*Lycæna Americana*, Harris) entangled in the same way by the flowers *Asclepias Cornuti*, Decaisne.

The same day I was attracted to two fine specimens of the *Argynnis* butterfly on one of the swamp thistles. I wondered why they were so quiet. Examination revealed a spider of almost the exact colors of the involucral scales. He had already sucked dry one specimen and was at work on the other.

I have frequently, in New Brunswick, observed gigantic *single* specimens of *Habenaria fimbriata*, R. Br. It remained for Rhode Island to show me a group of a dozen or more of these elegant plants together. I found them, a few days since, near Buttonwoods, Warwick, R. I., growing in a deep, woody hollow, near a stream. It was a sight to always remember.—W. WHITMAN BAILEY.

Sarcodes sanguinea.—The *Gardeners' Monthly* contains the following on the Snow Plant (*Sarcodes sanguinea*), by Thomas Meehan, "as the result of many examinations, to be an annual, germinating on small pine roots and subsequently obtaining subsistence from the earth, as do *Aphyllon* and *Epiphegus*."

I very much doubt the correctness of this statement, and as truth should be the object of all investigation, I give the result of some of my observations, made during a residence of seventeen years in the home of *Sarcodes*, and invite farther inquiry from those who are interested.

My attention was first called to the peculiar growth of *Sarcodes* as early as 1865, by a plant brought me by a brother, who was working in a hydraulic mine at the time (he had piped it out). The under-ground stem measured three feet, and a part was broken off. It is a common saying among the miners that "the roots of the 'Snow Plant' have no end."

During the years 1875 and 1876 my attention was more particularly given to the growth of *Sarcodes*, to ascertain if it was really a parasitic plant, and from what roots it drew its nourishment.

The under-ground stem is covered with thick, fleshy leaves (or scales), and in the axil of each leaf is an undeveloped flower bud. The stem, in the smaller plants, extends down only a few inches, while in the larger ones it reaches a depth of three feet or more. The root consists of a coralline mass, which contains from one to more than one hundred cubic inches, according to size and age of the plant. The descending axis is attached to this mass by short, brittle roots, about one inch in length.

I have dug dozens of these plants, and at all seasons of the year. Always found the coralline mass greatest about the time they began to appear above the ground in early spring. It is gradually absorbed in growing, leaving a honey-combed appearance in the soil. When the growth for the season is completed, there only remains about one cubic inch of the mass, and just *below* and a little to one side of the old under-ground stem, and attached to the mass of root, is a little "snow plant."

In the spring of 1878, I marked the place of growth of a number of these plants, as I had promised roots of them to Mr. Elwees, of England, and friends

in the East, who wished to try to grow them. I dug some of these plants in November, after the rains had commenced, and discovered that the root mass and little plantlet had greatly increased in size. I dug some of the staked plants early in March, and found them still progressing in growth, and others that were not dug came up and bloomed by the stakes.

My conclusions are, that *Sarcodes* is an herbaceous perennial, continuing through many years, and, by the little plantlet *always* being found *below* the older one, that it descends a little deeper into the earth each season, and this accounts for the great depth to which some of the under-ground stems penetrate.

As to the germination and infant life of *Sarcodes* I know nothing, but am satisfied that they receive their nourishment from the earth after they attain any considerable size.—MRS. R. M. AUSTIN.

New Indiana Plants.—Four species have just been added to the list of known Indiana plants, viz: *Asclepias phytolaccoides*, growing abundantly in the college grounds at Wabash College, Crawfordsville; *Habenaria orbiculata*, Avilla, Ind.; *Epilobium augustifolium;* and *Sambucus pubens.*

EDITORIAL NOTES.

PROF. BUREAU has been appointed Director of the *Jardin des Plantes* in place of the late M. Decaisne.

PROF. LUCIEN M. UNDERWOOD has been elected Professor of Geology, Zoölogy, and Botany in Syracuse University.

THE DEPARTMENT OF AGRICULTURE report for 1881-2, contains some interesting matter pertaining to bacterial subjects, illustrated with several colored and uncolored plates.

THOMAS J. HOWELL, in *Pop. Sci. Monthly*, shows that N. Am. plants can be divided into three or four distinct floras, corresponding to the different geological formations they inhabit.

EXTENSIVE PREPARATIONS are being made by the Chicago scientific public for the American Association of Microscopists, which holds its annual meeting in that city from August 7 to 10. A large attendance is anticipated.

THE LIBRARY OF PROF. J. DECAISNE, probably one of the finest in Botany, Horticulture and general Natural History sold since Jussieu's time, was sold in Paris last month. The catalogue, containing a portrait of Decaisne, and a biography by Bornet, covered 480 pages.

IT IS TO BE HOPED that there will be a large attendance of botanists at the A. A. A. S. meeting at Minneapolis, beginning August 15th. No better place for botanists could have been selected, and every moment can be made pleasant, not only in exploring new ground, but in that congenial companionship which the western worker, particularly, is denied during the greater part of the year. The biological section under Prof. Beal ought to be of great interest, and botanists should make a strong rally to its support.

THE TORREY BULLETIN'S "Contributions toward a list of the State and Local Floras of the U. S.," appears with its fourth part in the number for June, being devoted to the "Southern States." Kentucky is credited with 11 lists, Tennessee with 1, Alabama 1, Mississippi 1, Louisiana 3, Arkansas 2, Texas 5.

DR. HERMANN MULLER concludes that the flowers of *Pulmonaria officinalis* change from red to blue, as they grow older, in order to indicate to the intelligent bees (*Anthophora pilipes*, F.) which fertilize it, which flowers should be visited by them for their own and the plant's profit. One bee which he watched visited 182 red to 10 blue ones.

COL. R. H. BEDDOME has just published a hand-book of Indian ferns. It covers the same area as that included in Hooker's "Flora of British India," and includes 25 per cent. of all the known ferns. It is the first attempt to study Indian ferns in the field, and the result is most satisfactory, the species numbering 661, grouped under 98 genera. There are 300 illustrations.

P. C. SMITH, ESQ., of Circleville, Ohio, gives in the *Pop. Sci. Monthly* some strong evidence in favor of the idea that the rings of growth in trees are annual rings. The evidence relates principally to oaks, and is based upon the "hacks" made by old government surveyors of known date. A counting of rings from the "hacks" out corresponds in every case to the number of years known to have elapsed.

IN HACKEL'S recent monograph of the European *Festucæ* there is very careful and minute work in the grouping of forms. For instance, *F. ovina* has 9 sub-species, the first sub-species (*Eu-ovina* by name) has 8 varieties with names, the var. *vulgaris* having 5 named sub-varieties, the var. *duriuscula* 7, etc. *F. rubra* has 6 sub-species, some of which have seven varieties, and some of these as many sub-varieties.

PROF. W. C. WILLIAMSON ADDUCES (vide articles in journals) additional evidence confirmatory of Prof. A. Dickson's interpretation of the morphology of the pitchers of *Cephalotus follicularis*. His testimony seems to leave little room for doubt that the petiole of the true leaf is identical with the petiole of the pitcher, which is formed by the pouching of the leaf blade and covered by the lid, an outgrowth from the upper surface of the blade.

IN AN INTERESTING note in *Science*, Prof. N. S. Shaler discusses the function of the "knees" of the swamp cypress (*Taxodium distichum*). He concurs with the common explanation that they permit the access of air to the roots. He also considers that we have in it the case of the survival of a species owing to a peculiar habit of growth. These cypresses, when grown upon dry ground, develop no such thing as "knees," but when driven to the water these begin to develop. In this way a "peculiar organ is developed for a special purpose," and, crowded from the dry ground by the broad-leaved trees, it has sought and found safety in the swamps.

WINTER HAS some interesting notes in the May *Hedwigia* on N. American fungi. He considers *Æcidium hemisphærium* Peck on *Mulgedium*, to belong to *Puccinia Prenanthis*; and the teleutospores of a *Puccinia*, found by A. B. Seymour in Illinois, on *Lophanthus nepetoides*, he refers to *P. verrucosa*. What is un-

doubtedly the latter species was found by the writer near Chicago a few days since on *L. scrophulariæfolius*. He also advocates keeping the *Æcidium* on *Ranunculus abortivus* (*Æ. Ranunculi* Schw.) as a species separate from *Æ. Ranunculacearum* DC., which is common to many *Ranunculaceæ*, and suggests that it may belong to some *Uromyces* on a monocotyledonous host.

CURRENT LITERATURE.

Supplement to the Catalogue of the Davenport Herbarium.—This brings the Fern Catalogue up to March, 1883, and contains valuable notes on various species, by Mr. George E. Davenport. Mr. Davenport also publishes a very neat and convenient Check List of N. A. Ferns, including 32 genera, 161 species, and 24 varieties.

Botanische Mikrochemie, by V. A. Poulsen, translated from the Danish by Carl Müller. pp. xvi, 83. Cassel: Theodor Fischer.—The publication by Mr. Penhallow of his "Vegetable Histology" recalls a little book by the above title, which, though published more than a year ago, has not received the attention in this country which it deserves. To every reader of German it will commend itself at once, and its German is so easily read that even a student with but a cursory knowledge of the language will find little difficulty in picking out from it much that is useful. The first part of the book is devoted to "The Microchemical Reagents and their Use." Under this head fifty reagents are named. The manner of using each and the reactions for which they are used are clearly and briefly stated. To this part is appended a few pages treating of preservative media and cements. The second part enumerates "The Plant-substances and the Method of their Detection." Forty-one substances are given, together with the reagents and methods to be used for their detection. Altogether, a more useful little book could hardly be found. It should be in every laboratory and on every working table. It is much to be hoped that some one may soon obtain the right of translating it into English, that its usefulness to English and American students may be enhanced. It is to be regretted that the only similar book in English, Penhallow's "Vegetable Histology," was so marred by the publisher, in order that it might minister to his pride in heavy paper and wide margins. Notwithstanding the fact that Poulsen's book contains twice as many pages and nearly three times as much matter, it can be sold for 3 marks instead of $1.20. The book is an inch and a half narrower and two and a half shorter than Penhallow's, and yet the printed page is larger. Moreover it is bound as a hand-book should be, so that it will lie open at any page. We hope Mr. Penhallow will see to it that when a second edition of his book comes out it shall not sacrifice usefulness to looks.

On the Relations of Micro-Organisms to Disease, by Dr. W. T. Belfield, of Rush Medical College. Chicago, 1883. 12o., 131 pp. Illust.

Bacteria and the Germ Theory of Disease, by Dr. H. Gradle, of the Chicago Medical College. Chicago, 1883. 8o., 219 pp.

These works treat the subject in a comprehensive, careful and judicious manner. They have the merit of presenting the great mass of information on the subject, which is largely the work of foreign biologists, and consequently published in foreign languages, in a well digested and readable form. While primarily addressed to the medical fraternity, they are equally intelligible and instructive to all who are interested in the *rôle* of bacteria or the etiology of disease. As the works have a pathological aim, they contain no characterization of species or systematic classification. Much attention is deservedly given to methods of manipulation and the trustworthiness of observers. References to authors and their works are ample, thus facilitating the consultation of the

original sources of information, if one desires to form an independent judgment. The first mentioned work contains eighteen excellent cuts from photomicrographs, partly original, and all new to American readers; it also has an appendix, giving methods of staining and manipulation for the detection and study of bacteria.. The second work is to be commended for the very full table of contents and index.

ARTICLES IN JOURNALS.

BAKER, J. G.—Synopsis of the Genus Selaginella (continued from p. 145) (2 new species), *Jour. Bot.* 21. 210.
BEDDOME, COL. R. H.—Review of his "Hand-book to the Ferns of India," by J. G. Baker, *Nature*, 28. 146.
BROWN, J.—Leaves and their Environment, *Nature*, 28. 55.
DAVENPORT, GEO. E.—A new Fern (Cheilanthes Pringlei, from S. E. Ariz.), with plate, *Torr. Bull.* 10. 61.
DINGLER, H.—Contributions to the Oriental Flora, II. *Flora*, May 11.
DOWSON, S. S.—Ground Ivy, *Nature*, 28. 126.
ELLIS, J. B.—Notes on the Study of Fungi, *Am. Nat.* 17. 782.
FEHLNER.—Leskea (?) Heldreichii Fehlner n. sp. (with plate), *Flora*, May 21.
FISCHER, DR. ALFRED.—Investigations upon the Parasites of the Saprolegniæ, reviewed by Büsgen, *Bot. Zeit.* May 18.
FITZGERALD, R. D.—New Australian Orchids (4 species), *Jour. Bot.* 81. 203.
GARDNER, J. S.—Reply to Nathorst on Fossil Algæ, *Nature*, 28. 52.
GODLEWSKI, C.—Contributions to a Knowledge of the Respiration of Plants, reviewed by W. Detmer, *Bot. Zeit.* June 1.
GOEPPERT and MENGE.--Review of their "Amber Flora," by J. Starkie Gardner, *Nature*, 28. 152.
GOETHE, R.—The Injuries of Frost to Fruit Trees and their Prevention, reviewed by Paul Soraner, *Bot. Zeit.* June 8.
HANCE, H. F.—Three new Chinese Begonias, *Jour. Bot.* 21. 202.
HICK, THOMAS.—Notes on Ranunculus Ficaria, *Jour. Bot.* 21. 198.
HOFFMAN, H.—Culture-investigations upon Variation (continued), *Bot. Zeit.* May 18 and 25.
HOWELL, THOMAS J.—The Geological Distribution of N. Am. Forests, *Pop. Sci. Month.* 23. 517.
KUSTH, H.—Bacterium Zopfii, with 1 plate, *Bot. Zeit.* June 8, 15 and 22.
LAYARD, E. L —The Sacred Tree of Kum-Bum, *Nature*, 28. 79.
MEYER, A.—Contributions to the Knowledge of Important Pharmaceutical Plants, reviewed, *Bot. Zeit.* June 15.
MOELLER, J.—Anatomy of the Bark of Trees, reviewed by Loew, *Bot. Zeit.* June 8.
MUELLER, F. V.—Plurality of Cotyledons in the Genus Persoonia, reviewed by Peter, *Bot. Zeit.* June 1.
MUELLER, HERMANN.—Effect of the change of color in flowers of Pulmonaria officinalis upon its fertilizers, *Nature*, 28. 81.
MUELLER, DR. J.—Lichenographical Contributions, XVIII. *Flora*, June 1.
NATHORST, A. G.—Fossil Algæ, *Nature*, 28. 52.
NORDENESKIÖLD, A. E.—The Scientific Results of the Vega Expedition, reviewed by E. Koehne, *Bot. Zeit.* June 22.
PAX, DR. FERD.—Flora of the Rehhorn near Schatzlar (continued), *Flora*, May 11.
PECK, CHAS. H.—A new Fern Rust (on Cheilanthes Pringlei), *Torr. Bull.* 10. 61.
PLOWRIGHT, C. B.—Classification of Uredines (giving the British species), *Grev.*
PROGEL, DR. A.—Flora of the District of Waldmünchen, reviewed by Peter, *Bot. Zeit.* June 1.
ROLFE, R. A.—Notes on Carruthersia and Voacanga, *Jour. Bot.* 21. 200.
SCRIBNER, F. LAMSON.—A list of Grasses from Wash. Terr. (2 new species, with cuts), *Torr. Bull.* 10. 63.
SHALER, N. S.—The American Swamp Cypress, *Science*, 2. 38.
STAHL, E.—Influence of Sunny or Shady Places upon the Formation of Foliage Leaves, reviewed by Wortmann, *Bot. Zeit.* May 18.
TANGL, E.—On the Division of the Nucleus in Spirogyra (with 2 plates), *Akad. d. Wissens., Wien*, 85. 268.
TOWNSEND, FREDERIC.—Review of his "Flora of Hampshire," by James Britten, *Nature*, 28. 122.
TRELEASE, WM.—On the Structures which favor Cross-fertilization in several Plants, reviewed by Hermann Müller, *Bot. Zeit.* June 1.
TSCHAPLOWITZ, F —Is there an Optimum of Transpiration? *Bot. Zeit.* June 1.
WILLIAMSON, W. C.—On Morphology of the Pitcher of Cephalotus follicularis, *Nature*, 28. 140.
WINTER, G.—On some N. Am. Fungi (4 from Ill., 4 from Ky.), *Hedw.* May.
ZALEWSKI, A.—Upon the Formation and Separation of Spores in Fungi, *Flora*, May 21, cont. June 1.

BOTANICAL GAZETTE.

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A Letter from Dr. Torrey to Amos Eaton.

In lieu of a biographical sketch this month the following extracts from a letter of Dr. John Torrey to Amos Eaton are given:

"DEAR FRIEND:—I send you a copy of the Constitution, etc., of our Society which we formed last winter. We are now in possession of our room in the New York Institution—we have already a considerable collection of minerals, plants, insects, etc. You may see an account of the Society in Bigelow Magazine. We meet once a week, have plenty of business, and I assure you we are in a *great* way. The resident members are mostly young men, and very zealous. Rafinesque, Knevely and myself were lately sent on an expedition to explore the Highlands, where we found some new species of plants. Rafinesque found two new fish. I have returned and left them there; they are going to explore the Shawangunk and Catskill mountains before they return. Send me every new thing you hear of relating to natural history, all your remarkable observations relating to the physiology of plants, etc. The Lyceum have resolved to publish a catalogue of the plants growing within thirty miles of New York. Rafinesque, Knevely and myself are a committee to carry it into effect. It was our intention at first to have given a *flora* with full descriptions, but found it a much greater labor than we expected, so have put it off till next spring—in the meantime the catalogue will appear.

"Send all your doubtful plants. I expect we can ascertain them among us, as we have several good botanists among us. Send particularly your grapes and ferns. Your *Sanguisorba media* is *Plantago Virginica!* I shall send you duplicates of all my new species that I have, with descriptions.

"Who understands the grapes and Cryptogamia best that you are acquainted with? Send me word, I should like to correspond and exchange with him.

"Eddy and myself are now arranging his herbarium, which is in great confusion—the most of his plants he has not seen for several years. The whole he has deposited in the *Lyceum*. It contains many plants from the pine barrens of New Jersey, many from Georgia by Le Conte, some of which are new. Many of Pursh's new species were furnished him by Le Conte, Eddy, etc., for which he has not made any acknowledgement. Rafinesque discovered *Drosera filiformis* in 1802, and published it in 1811 in his *Precis des Decouvertes* (?); this and many other species Pursh has stolen.

"The circular address of Rafinesque which I send you will give you some idea of his character. He is the the best *naturalist* I am acquainted with, but he is too fond of novelty. He finds too many new things. All is new! new! He has an opinion that there are no plants common to Europe and America. *Galium aparine* is *G. aparinoides*, Raf., etc., etc.

"I have lately had a great dispute with Raf. respecting Bolton's Fungi, whether it was of Halifax in Nova Scotia or England. He asserted that it was Halifax in England, and I as strongly denied it, but on referring to the copy in the Hosp. Library, I was obliged to give up. I believe you were as much mistaken as I was.

"I suppose you are tired of reading, so farewell.

"Your friend,

"P. S. We have received Elliott's Botany of Carolina and Georgia, as far as *Pentandria digyna*, 1 vol., 8vo. It contains full descriptions as far as it goes, and is the best book on American botany ever published. Tell me whether you want any subscriptions for your *Botany of the Northern States*; if you do I can get about sixty in the course of a week (I think). It would be a good time to publish it *now*, as you may [be] anticipated by some other botanist if you delay it till next summer. Eddy has proposed to me to publish with him a flora of one hundred miles around New York. We have together about 1,400 species, but

I do not think myself competent to join in so important a work. If I can render you any assistance by communicating to you descriptions or specimens of plants, I shall do it with the greatest pleasure."

REMARKS.—These extracts include all of the botanical matter of this letter. There is no date, but we can judge that from various allusions. The Lyceum of Natural History to which he refers was founded in 1820, I think, and this is a year after. Elliott's Botany was published (Vol. I.) in 1821. The letter is specially interesting as containing an opinion of Rafinesque by one of his contemporaries, and one who apparently knew him very well. "He is the best *naturalist* I am acquainted with," are the words, "but he is too fond of novelty. He finds too many new things—all is new! new!" a fault which is common to many even of our modern scientists, and for which Rafinesque ought not to be blamed any more than another.—JOS. T. JAMES.

Botany at the Minneapolis Meeting of the A. A. A. S.

This meeting was a memorable one for botanists, there being more in attendance than ever before, and for the first time botanical papers were in the majority in the section of biology. But, after all, the interest at such a time is not so much in the papers read as in the personal contact of the workers who may long have known of each other but never have met, and for whom the clasp of the hand and the glance of the eye cements a friendship already formed. At such times beginners meet with the leaders whose names are household words, and find them genial, hearty, whole-souled men, with a cheering word for all, and they return with fresh zeal to their work; at the same time these leaders have largely augmented their following. Botanical zeal ran so high that it finally culminated in the formation of an American Botanical Club, having no constitution or by-laws, but simply to be an association of botanists who are members of the A. A. A. S., for the purpose of general botanical conference and excursions during the meetings of the American Association. Prof. W. J. Beal was chosen President, and Prof. J. M. Coulter Secretary of this club, which expects to enter fairly on its work at the next meeting in Philadelphia. The members enrolled at Minneapolis are as follows: W. J. Beal, J. M Coulter, W. G. Farlow, C. E. Bessey, J. C. Arthur, W. R. Dudley, Dr. Geo. Vasey, Dr. E. L. Sturtevant, Lillie J. Martin, Mrs. Ellen B. Reed, Dr. P. R. Hoy, N. S. Townshend, Warren H. Manning, Sadie M. Manning, C.

V. Riley, Robert P. Bigelow, Jos. F. James, B. P. Colton, E. S. Bastin, S. A. Forbes, F. A. Gulley, Ellen E. Smith, Leander Stone, Mrs. Leander Stone, E. W. Claypole, W. R. Lazenby, W. M. Canby, J. W. Chickering, Edw. Pennock, John M. Holzinger, thirty in all, and from thirteen different States. A committee was appointed consisting of Profs. Coulter, Farlow and Bessey to consider the subject of domestic and foreign postage upon botanical specimens. This committee is instructed, by correspondence or otherwise, to obtain information as to grievances, and to send a remonstrance in the name of the association to the proper authorities. They expect to be able to present a favorable report at the Philadelphia meeting.

At a second meeting of the Club, Prof. E. S. Bastin, of the Chicago College of Pharmacy, read a paper entitled, "A fact bearing upon the evolution of the genus Cypripedium," which was followed by considerable discussion, chiefly upon teratological matters, in the course of which Prof. Bessey took occasion to express a very decided opinion about laying too much stress upon monstrosities. Dr. W. G. Farlow also gave an exceedingly interesting talk upon some of the common parasitic cryptogams which are most convenient and useful for class work, and many ideas were obtained which will blossom out in more than one laboratory this fall and winter.

At a third meeting of the Club, a committee was appointed to provide for meetings and excursions at Philadelphia next summer, and, as this city is a perfect nest of botanists, and within easy reach of many more, an outpouring of botanists is expected. With the rich collections of the Academy of Sciences, the famous ballast grounds, the New Jersey barrens, etc., there need be no lack of profitable excursions. The committee to perfect all these arrangements consists of Prof. J. C. Arthur, of Chicago, and J. H. Redfield, Esq., of Philadelphia, who have power to appoint a third member. At this same meeting W. M. Canby, Esq., was present, just returned from his northern boundary survey, where he was officially looking after grazing lands, but at the same time keeping his eyes open botanically. He gave the Club some account of the region traversed, and the characteristics of the vegetation, calling attention particularly to the commingling of Pacific coast and Rocky mountain forms as the mountains approach the British boundary.

Several small excursions were made, all of which resulted very profitably, but owing to the impossibility of arranging anything more than a few hours in advance, they were more slimly

attended than need be hereafter. Botanists should go to Philadelphia next year with specimens, queries and anything of botanical interest, as the Club will give abundant opportunity for informal discussions that could find no place in the regular sectional meetings of biology.

In regard to the botanical work done at Minneapolis during the sessions of the section of biology, the following account will give some idea. The papers are numbered in the order of their presentation, without any reference to their association numbers.

1. PROF. W. J. BEAL, as Vice President of Section F, gave the customary address at the opening of the sessions, showing the important relations existing between agriculture and botany. The address will speedily appear in full in *Science*.

2. DR. E. L STURTEVANT read a paper upon "Parallelism of structure of Maize and Sorghum Kernels," in which it was very clearly shown that what must be considered as three distinct species of corn have been produced artificially, the regions of chit, starch and corneous layer appearing quite constantly different in cross sections of flint, dent and pop-corn.

3. D. P. PENHALLOW presented a paper on the "Relation of root and leaf areas; Corn," which, in the author's absence, was read by abstract.

4. E. W. CLAYPOLE read a paper entitled "Note on the present condition of the Box Huckleberry, *Vaccinium brachycerum*, in Perry county, Penn." A very satisfactory conclusion to this paper was reached when the author stated that he had with him for distribution specimens of this very rare plant.

5. DR. E. L. STURTEVANT, speaking of "Influence of position on seed," showed by numerous experiments that in the case of corn, at least, position goes for a great deal.

6. DR. E. L. STURTEVANT, on "Agricultural Botany," struck out boldly in a new and very important field. He claimed that all fixed varieties of the agriculturist and horticulturist are fit subjects of classification, and that for convenience of identification they should be classified. Such arrangement, however, should not be made to coincide with ordinary botanical classification, for in the latter species are treated as the resultants of natural forces; but in order to produce the varieties of agriculture and horticulture an entirely new force comes into play, namely, the intelligence of man, and its results should be classified on a new basis. A scheme was hinted at, but not clearly defined; but enough was given to make it evident that the author had opened up a new world of labor, which it is for him now to

cultivate, and which will amply repay investigation in many more directions than agriculture and horticulture.

7. MISS M. E. MURTFELDT read a paper upon the "Periodicity of Sabbatia angularis," in which a period of seven years was made out, the explanation of which was in vain sought for.

8. PROF. W. R DUDLEY presented a paper upon "An abnormal Orchid; *Habenaria hyperborea*." It seems that the author discovered many spikes of this species in which the flowers were spurless, which fact was abundantly testified to by the display of specimens.

9. PROF. W. R. DUDLEY also spoke of the "Origin of the Flora of the central New York lake region," giving it as his opinion that the origin of the flora of this very peculiar region must be looked for to the north and west.

10. PROF. JOHN M. COULTER read a paper upon the "Developement of the Dandelion Flower," which was an embryological study. The results obtained are noted elsewhere in this number.

11. PROF. W. J. BEAL spoke of the "Leaves of the Gramineæ with closed sheaths," bringing up several instances to illustrate the statement.

12. PROF. J. C. ARTHUR spoke of "A supposed poisonous seaweed in the lakes of Minnesota," a paper which probably excited greater local interest than any paper presented to the section. The summer before Prof. Arthur had received specimens of water from certain Minnesota lakes which seemed to be fatal to cattle drinking it. The specimens were found to contain an alga which is probably *Rivularia fluitans*. A visit to one of the lakes showed these minute balls occurring in vast quantities, forming a thick scum on the surface. Such masses exposed to the sun and decaying gave off an offensive odor, and in this condition were apparently fatal to cattle using the water. In two or three weeks the danger was past. If this be *Rivularia fluitans* it is its first discovery in America, though it is now found to be quite generally distributed in Minnesota lakes. Dr. Farlow, Prof. Arthur and the writer found an abundance of it in Lake Minnetonka. The author did not give it as his unqualified opinion that the plants were poisonous, but that they seemed so.

13. JOSEPH F. JAMES read a paper entitled "The position of Compositæ in the natural system," in which he very justly claimed for *Gamopetalæ* the most highly modified flowers, and among them *Compositæ* as of the highest rank.

14. PROF. E. S. BASTIN presented a paper entitled "A fact

bearing upon the evolution of the genus Cypripedium," in which he noted the discovery of a *Cypripedium* with an almost perfectly regular flower, and from its structure called attention to the probable morphology of the normally modified parts.

15. Dr. W. G. Farlow spoke upon "Some Algæ found in water supplies," in which an interesting account was given of the author's investigation of the water supply of Boston, the Nostocs with "cucumber taste" and those with "pig-pen odor," the dangers to be anticipated in using water from any lakes in general, and Minnesota lakes in particular, and the care necessary to avoid them. Incidental reference was also made to Prof. Arthur's discovery of *Rivularia fluitans* the year before.

16. Dr. W. G. Farlow also spoke upon "Certain parasitic Fungi," being an account of some of the most injurious species of the genus *Peronospora*.

17. C. Richardson read before the Chemical Section a paper upon "Sotol, a Mexican forage plant." The plant in question is *Dasylirion Texanum*, and is used as a forage plant in Texas, sheep becoming very fond of it, and when using it can do without water for several weeks. A plain covered with it was described as looking like a field of cabbages.

It will be seen by this hasty summary that botany was well represented at Minneapolis, and it is the expectation that Philadelphia will witness a far greater gathering of botanists and botanical papers.—J. M. C.

GENERAL NOTES.

Aquilegia longissima is the name (for which, I believe, I am responsible) of a species discovered by Dr. Palmer, in Northern Mexico, and distributed in his collection. From Dr. Palmer's seeds plants were raised in the Botanic Garden here, and probably elsewhere. Its first blossoming seemed to be out of season, and abnormal; but it is now blossoming well, and if by no means the handsomest species of the genus, is the most extraordinary. It is just coming into blossom now, in the latter days of July, when its relative, *A. chrysantha*, has passed its prime. The spurs (from which it gets its name) are as much longer than those of *A. chrysantha* and *A. cœrulea* as those are of the old-fashioned species. They are four inches long, and slender-filiform, even quite to their origin. The limb of the petals, which in *A. chrysantha* often nearly equals the sepals, and inclines to spread, is in this species about as widely spreading and almost as long as the narrower (lanceolate) sepals, elongated-spatulate in form, the orifice of the spur at its base, abrupt and barely a line in diameter. The flower, as in its relative, is erect or a little inclined; the straight spurs, with a manifest nectariferous knob at base. One would like to know what Lepidopterous insect it is that drains it.—A. Gray.

Some Rhode Island Notes.—I have long been interested in local names of plants. Here are some Rhode Island names. Here, in Warwich, the *Celtis occidentalis* has the name of "Mining berry." *Hypericum Sarothra* is called "Louseweed," because the seed-pods crack between the fingers in a rather suggestive manner. In South Kingston I [illegible] that the country people have corrupted *Rhododendron* into "Witch-[illegible]" showing what sound will do for philology.

I find ants visiting the cup-shaped [illegible] at the bases of the leaves of *Cassia Chamæcrista*, which are nectar-secreting. Is there any reciprocal benefit?

W. W. BAILEY.

Mitella diphylla.—The flowers of *Mitella diphylla* are almost at right angles to the scape, and are arranged on the $\frac{2}{5}$ plan. But the fruiting specimens have a cup-shaped pod, which is always perfectly erect, bearing in its open cavity the seeds. In order to assume this erect position, since all the scapes are more or less slanting, the fleshy pedicels must take a one-sided arrangement, and on horizontal scapes this twisting of the pedicels places the pods again at right angles to the scape.—AUG. F. FOERSTE, *Dayton, O.*

Botanists and Botanizing at Minneapolis.—The meeting of the A. A. A. S. proved, as had been hoped it would, the largest and most interesting in the history of the Association in respect to the number and standing of the botanists in attendance, and the number and importance of the botanical papers presented. In truth, botany, for the first time took the lead in the biological section. If the reason be sought for this awakening of a long neglected interest it is found without difficulty. The botanical journals have had much to say during the last year about the richness of the flora in Minneapolis and vicinity. The knowledge of this fact was scarcely due to the kindling zeal of local collectors, for Minnesota possesses but a few workers, and these exchange or distribute little material, but is directly traceable to the Summer School of Science, founded by the University in 1881, and which has increased in interest and attendance each season since.

A distinctive feature of the botany given at this school has been the study of plants irrespective of the value of their classificatory characters, the illustrative examples being selected from all grades of vegetation, from the simplest unicellular seaweed to the most highly differentiated composite. The laboratory is the all-important adjunct of such a course, and in this instance the supply of material for it came entirely from the fields as it could be found by the instructor, or was brought in by the pupils. This scouring of highways and byways for all manner of vegetable growths led to a recognizance of the abundant occurrence of interesting plants, a discovery that attracted attention in other parts of the country, and resulted in a widespread desire to see and profit by it. The liberal policy of the College of Agriculture, in considering and following up with an investigation the reported poisoning of cattle by drinking lake scums directed special attention to the flora of the lakes. Couple these facts with the conviction, that had almost become general, that one would be likely to meet a large number of his fellow laborers at Minneap-

olis and enjoy the quickening influence of the exchange of opinions, and of social intercourse, and the increased attendance is accounted for.

A strong attempt was made to have excursions for the particular benefit of the botanists, but owing to the difficulty of learning the plans of the local committee in time to make corresp[illegible]ng arrangements, and duly notify those interested, the attendance upon [illegible]re arranged was small, much to the regret of all concerned. Those [illegible]so fortunate as to go, both specialists and general collectors, were ent[illegible]astic over their success in obtaining desirable specimens.

This experience in conserving the interests of botanical members led to the conviction that to insure the best results there should be well-matured plans developed before the Association convenes, and which should be so arranged as not to conflict with other excursions or exercises. A committee was accordingly appointed to attend to the matter for the Philadelphia gathering of next year, when we may expect still larger attendance and more profitable herborizing.—J. C. A.

Chlorophyll corpuscles and Pigment bodies.—Every student of plant histology knows how impossible it is often to speak definitely with regard to cell contents. Attempts have been made to classify them, but only in well marked cases are they satisfactory. When any system finds its best exemplification only in exceptional cases it is time to look for another. Schimper, at Bonn, and Meyer, at Strassburg, have been working independently at certain phases of this problem, and have reached a more resonable conclusion than has ever been heretofore advanced. It looks as though the principal contents of cells, as varied as they appear, all have a common origin, that starch-formers, chlorophyll corpuscles and pigment bodies are related forms, sometimes even interchangeable, and are not produced in the protoplasm of the cell. This last statement is a regular iconoclast, for if we have ever taught anything with confidence about cell contents, it has been that we would have to look to protoplasm as the originator of most of them, that a chlorophyll corpuscle was nothing but colored protoplasm, that starch-formers were in some mysterious way born in protoplasm and chlorophyll, etc. But now those nameless little floating bodies, specks, needles, rods, etc., to which we have called no special attention, are all these things in various stages of formation, are called *plastidia* or *plastids*, and have existed from the very first in the plant, in the embryo itself, even in the embryo-sac and oösphere. Of course they are protoplasmic, are always present in meristems, and by the continuous growth and division of a few primitive *plastidia* the whole plant is supplied. This reduces the nomenclature of cell contents to a more uniform basis, but of course this common origin allows names to be applied rather to marked phases than to things which are specifically distinct, and allows every intermediate stage. Thus *leukoplasts* normally come from colorless *plastidia* in deep-seated cells, or may be from *chloroplasts*, or may under the action of light become *chloroplasts*, or may act as Schimper's *Stärkebildner*. *Chloroplasts* (chlorophyll copuscles) come normally from *plastidia* which are originally green, but they may come from *leukoplasts* exposed to the light, and often become *chromoplasts* (the pigment bodies). *Chrom-*

oplasts occur of all shades from carmine-red to greenish-yellow, but never blue. And so with chlorophyll corpuscles, pigment bodies, starch-formers and sundry other substances closely related, we may hope that we are approaching a natural classification of cell contents.—J. M. C.

The Genera Plantarum.—In the September *Am. Jour. Sci.* Dr. Gray reprints from the *Nation* a notice of the completion of Bentham and Hooker's *Genera Plantarum.* Begun in 1862 and finished this year, it stands as the second great botanical work of the century, the "Prodromus" of De Candolle being the other. Dr. Gray compares the various "Genera Plantarum" which have been published in the following interesting way:

"Some idea of the progressive enlargement of the field may be had by a comparison of the number of genera characterized in these successive works. The phænogamous genera of

Linnæus, "Gen. Pl.,"	ed. 1,	A. D. 1737,	were	887
" "	ed. 6,	A. D. 1764,	"	1189
Jussieu, "		A. D. 1789,	"	1707
Endlicher, "		A. D. 1843,	" (about)	6400
Bentham & Hooker,		A. D. 1883,	"	7585

If the last had been elaborated upon the scale of Endlicher, or with the idea of genera which is still common if not prevalent, the number of genera would have amounted to at least ten thousand. An estimate of the number of known species of each genus and higher group has been made throughout the work—a rough approximation only, mentioning first the number in the books, and the number to which, in the opinion of the authors, these may probably be reduced by the botanists who adhere to the Linnæan view of species; from which it appears that, upon the very strictest estimate, their number, as now known to botanists, is at least 95,620. In round numbers, it may fairly be said that about 100,000 species of phænogamous plants are in the hands of botanists. The five largest orders, as well for genera as for species, are the following, and in this rank: Compositæ, Leguminosæ, Orchideæ, Rubiaceæ, Gramineæ. The high standing of the orchid family in the list will be a surprise to many. Linnæus knew only a hundred species; five thousand is now a moderate estimate —about half as many as there are of Compositæ, which hold to their proportion of one-tenth of the whole. In both families every country and district is largely peculiar in its species and types. The far greater prominence of Compositæ over orchids is owing to the vast number of individuals in the former, and their paucity in the latter."

Injurious Parasitic Plants.—It has become the fashion in certain quarters to decry the work done by the Department of Agriculture, but this is by no means politic or kind. The department is blessed with a maximum amount of ambition and a minimum amount of money, and it is hard to see how it could do more. Much good work has already been done, work that has yielded abundant returns in the better cultivation and preservation of various crops. C. V. Riley, in charge of the Entomological Commission, has well investigated the haunts and habits of various noxious insects, and the cost of these investigations has been but a trifle when compared with the damage to crops that has

been prevented. Such a work shows a very wise and far-sighted policy, and undertaken, as it has been, in the true scientific spirit, it has satisfied not only those immediately benefited, but entomologists as well. It is the densest stupidity which refuses the expenditure of hundreds to save thousands, or which looks for immediate practical results from the first appropriation. "Learn to labor and to wait" is not a part of the average legislator's policy, to whose mind results must be immediate or they are nothing. Now in the midst of all this good work that is being done by the department, and that has been so wisely provided for, why is it not seen that another great work is waiting to be done, a work that can not be entered upon too quickly? Noxious insects are not the only destroyers of crops, but hosts of injurious parasitic plants are spreading everywhere. We venture to say that loss from this source is as great as from insects. The habits of these injurious parasites have not been studied much in this country, but there are competent men who are working at them in a private way, but this is slow business when the country is in need. The rusts and smuts, and molds and rots, all need studying, and there could be no wiser appropriation of public money than to organize a commission for such investigation on the same basis as the Entomological Commission. The Department of Agriculture should make the move in this matter, and urge upon the next Congress the necessities of the case, backed by all the scientific and agricultural journals of the country. A laboratory for such investigations can be fitted up with very little outlay, and with unlimited opportunity for observing these parasites over large areas the results would undoubtedly be most satisfactory. There is some way of getting rid of these pests, and it can only be found by a careful study of their life histories. Usually they pass through different phases upon different hosts, and these hosts may sometimes be necessary to their further development. If then some host plant, which may be of no economic value, is acting as a carrier of these destructive parasites to some valuable crop, what incalculable importance it would be to know it! This is but the vaguest kind of intimation as to the direction in which practical results might speedily be reached. A commission for the study of injurious parasitic plants should now be the ambition not only of the Department of Agriculture, but of every botanist and agriculturist in the country.—J. M. C.

EDITORIAL NOTES.

PROFESSOR COULTER gave an account of the development of the dandelion flower before the A. A. A. S. at Minneapolis. His conclusions were: I. The inferior ovary is produced by an arrest in the development of the floral axis, the rising in a peripheral ring of the floral organs, and the gradual arching over of the cavity thus produced by the carpellary leaves; II. The syngenesious anthers are united by contact and pressure, but in no sense structurally: III. The ovule is not produced directly from the axis, but is an outgrowth from the surface (probably the mid rib) of a carpellary leaf. The paper opened up a number of incidental questions of much interest. It will appear shortly in the *American Naturalist*.

PERONOSPORA VITICOLA was found on *Ampelopsis* at Minneapolis by Dr. Farlow. The discovery is an important one in view of the strenuous efforts of European countries to prevent the spread of the disease. Our native *Ampelopsis* is almost as common in many cities of Europe as in this country, and specially observable in Geneva.

DR. J. D. TRASK, of Astoria, N. Y., has published an account of the poisoning of thirteen persons, belonging to several families, five of whom died, from eating unwholesome mushrooms. He is of the opinion (which to us does not seem likely) that many deaths occur annually from this cause. The trouble appears to come from confounding two poisonous white-gilled species of mushrooms, *Amanita phalloides* and *A. verna*, especially the former, with edible kinds. While a few poisonous species are to be avoided, there are, on the other hand, many kinds that may be eaten with impunity, and of these the most desirable—*Agaricus campestris*, the common mushroom with pink gills, *A. procerus*, one of the largest species of the genus, *Morchella esculenta*, the morell, and *Lycoperdon giganteum*, the great puff-ball—are so characteristic in appearance as to offer small opportunity for mistakes, and that only to the most careless observers.

A PAPER, by E. W. Claypole, on the occurrence of *Vaccinium brachycerum* in Pennsylvania, read before the Minneapolis A. A. A. S., will soon appear in the proceedings of the American Philosophical Society.

PROFESSOR HARVEY, of the Arkansas Industrial University, has distributed an excellent paper on the Forest Trees of Arkansas, reprinted from the *American Journal of Forestry*. It is a very full account of the arboreal flora, giving distribution and many notes of interest.

M. VESQUE claims that the histological characters of plants can be used for their systematic classification. It may be that the systematic classification of plants can be made more easily than the systematic classification of their tissues, but that there is endless confusion about the latter, every student of histology knows. Vesque depends on such structures as stomata, hairs, the fibrovascular bundles, etc., and really shows that many natural groups can be made upon the basis of such characters.

THE TABLE OF CONTENTS and index for the first volume of *Science* are models of completeness and convenience.

IT SEEMS that atmospheric pressure must be counted as one influence on the growth of plants. Wieler, at Tübingen, has been experimenting, and finds that diminished atmospheric pressure induces more rapid growth, of course within certain limits. As Dr. Goodale remarks in *Science*, such investigations "may compel us to revise some notions now held in regard to the adaptation of plants to their surroundings in past ages, and at the present time upon high mountains."

PROF. WITTROCK has just published, in Stockholm, a "Snow and Ice Flora," which is included in Baron Nordenskjöld's studies in the extreme north, but is an exhaustive account of our knowledge of the subject. Forty-seven species are described, thirty-seven of which belong to the snow and ten to the ice. They

are almost entirely algæ of microscopic size and very low organization, mostly unicellular. The most prominent and most abundant of the plants is the famous "red snow," *Sphærella nivalis*, and next to it, and the only plant limited entirely to the ice flora, is a new species discovered by Nordenskjöld and Berggren and named *Ancylonema Nordenskjöldii*. This latter plant occurs in such abundance that it gives the ground a purple-brown color, and Baron Nordenskjöld thinks it has much to do with the melting of the ice.

IT NOW APPEARS that even the spermogonia of *Uredineæ* attract insects by a sweet secretion, and that doubtless the spermatia are carried away by them.

THE BULLETIN of the Buffalo Naturalists' Field Club continues in its fourth number a goodly number of interesting botanical notes, chiefly by David F. Day, Esq.

THE FIRST ANNUAL REPORT of the Ohio Agricultural Experiment Station is before us, and is full of matter interesting to botanists. The director, Prof. W. R. Lazenby, does his work in such a scientific spirit that we expect not only agriculture, but physiological botany to share in the results.

IN THE TWELFTH ANNUAL REPORT of the State Geologist for Indiana, just published, is a catalogue of the plants of the central-eastern part of the state, prepared by Dr. A. J. Phinney, of Muncie. The list is interesting in many respects, not the least of which is that it comes from the highest ground in the state and a region little visited by botanists.

WE ARE SURPRISED to learn, through a letter from De Bary to Dr. Farlow, that Dr. Engelmann is quite ill at Strassburg. He sailed from this country late in June.

TOO LATE FOR OUR last issue we learned that Poulson's Botanische Mikrochemie is being translated by Mr. Wm. Trelease, and what we "hoped" in the review was already being accomplished. We understand that Cassino is to publish it, and with a full realization that it is to be used in the laboratory. We bespeak for it a hearty reception into the botanical laboratories of this country.

A GREAT WORK is being done for botanists at the N. Y. Agricultural Experiment Station, under the direction of Dr. E. L. Sturtevant. A command of money and a most suggestive mind have made possible series of experiments upon a more extensive scale than ever attempted in this country before. Dr. Sturtevant, while keeping agriculture in the foreground, is quietly laying up an immense store of material for the philosophical botanist. He is bringing to bear upon plants every possible influence that can be made to affect their growth, and really he is seeing incipient species springing up under his own manipulation and can recognize the forces that are effecting the change. Many other experimenters in agriculture are seeing the same results, but very few have the acuteness to discern the causes. This work has but begun, but we look for it to become a source of unlimited material not only for the agriculturist but for the professional botanist. Already has Dr. Sturtevant intimated certain results which will completely overturn and tear up by the roots some of our preconceived notions, and one of these days we may look for something startling.

CURRENT LITERATURE.

Notes on some Species in the third and eleventh centuries of Ellis' North American Fungi, by W. G. Farlow. From Proc. Amer. Acad., XVIII, pp. 65–85.

This article is prefaced by an extended discussion on the proper selection of a name for the species where several stages or forms have been described as belonging to separate genera. To conform as nearly as possible to the general usage of systematists, it seems necessary to adopt the oldest specific name without regard to the stage for which it was used. This is tacitly admitted by the author who objects, however, to applying the rule to Uredineous plants, owing to the difficulty of identifying with certainty many forms named by the older mycologists. He therefore advocates the suppression of all æcidial names and of such uredo names as are of doubtful identity, thus confining the selection of the name to the teleutosporic forms and the unquestionable uredo forms. This is a commendable method on the score of accuracy, but it is to be feared will eventually fail of success owing to the tendency to revert to the more general usage, particularly as it is already adopted by Winter, the author of the most important contribution to the systematic treatment of *Uredineæ*, and other eminent German writers. The period of confusion in nomenclature should be passed as soon as possible, and an important factor in securing this end is uniformity of methods.

After giving a caution regarding the hasty grouping of æcidial forms with the supposed teleutosporic stages, the author proceeds to the annotation of nearly a fourth of the species of the two centuries. No. 1003 gives an *Æcidium* on *Anemone nemorosa* and on *Ranunculus abortivus* under the name of *Æ. Ranunculacearum* DC., both of which Dr. Farlow inclines to think distinct from the true *Æ. Ranunculacearum*. No. 277–8 *Ceroma luminatum* is referred to at length, and the suggestion made that it may be the æcidial stage of some *Phragmidium*. Nos. 247 and 248 are the forms of rust on *Rhus* known respectively as *Pileolaria brevipes* with depressed spores, which the Doctor holds to be the uredo form, and *Uredo Toxicodendri* with spirally marked ovate spores which he considers the teleutosporic form, although Winter has reversed them. These, he thinks, should not be separated from the genus *Uromyces*, and that the name to be adopted is *Urom. Toxicodendri* Berk. & Rav. No. 239, the *Uromyces* on *Spartina stricta*, described in Bulletin of Bussey Inst. II, 243, as a variety of *U. Junci*, is erected to a species and described as *Urom. Spartinæ*, Farlow. It has yet only been found at Wood's Holl, Mass. No. 240 is *Urom. Peckianus*, Farlow, on *Brizopyrum spicatum*, of which a description is given. It is closely related to *U. Dactylidis*, and ranges from Mass. to N. Jer. No. 1067 is a new species of *Uromyces* on *Melanthera hastata*, from Florida, of which a description is given as *Urom. Martinii* Farlow. No. 1068 was issued as the æcidial form of the last species under the same name, but as it is found to follow instead of precede the teleutosporic form, the assumption is considered hasty. No. 253, *Puccinia Lobeliæ*, Gerard, has priority, and is to be substituted as the name for *P. microsperma*, erroneously printed *P. microspora*. No. 257, *Puccinia aculeata*, should be superceded by *P. Podophylli*, Schw., an earlier name. No. 260, the *Puccinia* on *Proserpinaca*, is described as a distinct species, *P. Proserpinacæ*, Farlow, with the reservation that it may prove, upon examination, to be the same as that described by Vize, from California. The species is probably wide-spread, as it has been collected in Iowa. No. 1029, *Puccinia emaculata*, Schw., on *Panicum capillare*, is described. It is a species whose name has been a matter of uncertainty for a long time, being most often called *P. Graminis* var. *brevicarpa*, Peck, but the examination of Schweinitzian specimens now puts the matter at rest. No. 1051, the strange *Puccinia* on *Bouteloua curtipendula*, is not characterized, although the new name, *P. vexans*, Farlow, is used for it. It is so intimately associated with *Uromyces Brandegei* that the two occur in the same sorus, and the spores of the Uromyces resemble the single-celled spores of the *Puccinia* in all

respects, except that the former are papillate. Of course there is much probability that the two are variations of one species, as Dr. Farlow is inclined to think, although we prefer to keep them separate till more evidence is adduced, and do not see that the occurrence of the two forms of spores in the same sorus is a necessary proof of their genetic connection. No mention is made of the uredo on *Bouteloua* found in Iowa and described in the article on Iowa Uromyces in the Bull. Minn. Acad. Sci., vol. 2, which, although described as part of the *Uromyces*, may belong to either or both forms. So perplexing a case has not before appeared. No. 1052, *Puccinia Lantanæ* Farlow, from Bermuda, is described. This also has single-celled teleutospores.

The Grasses of the United States, being a synopsis of the Tribes and Genera, with descriptions of the genera, and a list of the species. By Dr. George Vasey, Botanist of the Department of Agriculture. Special Report—No. 63.

This, for the first time, gets together all our grasses, that we may look them in the face, and a goodly array they are, with 114 genera and 589 species. The author has long made a special study of the grasses, and this pamphlet is the result of much careful work and the promise of a work hereafter which will include specific descriptions. The object of the report seems to be specially to give those west of the Mississippi river a chance to name their grasses, and a commendable object it is, too, for botanists at the east have no conception of the "lost feeling" of the ordinary western botanist with all the botany of his region shut up in publications which are inaccessible to him. In this pamphlet the synopsis of the tribes and genera is chiefly a translation from Bentham and Hooker. Our large genera are as follows: *Panicum* 52 species, *Poa* 34, *Sporobolus* 26, *Paspalum*, *Aristida*, and *Muhlenbergia* each 23, *Stipa*, *Deyeuxia* (*Calamagrostis*) and *Eragrostis* each 20. Those genera with 10 species or more begin with *Agrostis* and *Bromus* each with 19, and then in order *Festuca*, *Andropogon*, *Bouteloua*, *Glyceria*, *Melica*, *Elymus*, and *Triodia*, under which last name it is hard to recognize *Tricuspis*. Of these species we note the author's name appended to no less than 30, six of which are in the genus *Poa*. It is yet hard to accustom ourselves to recognize *Deyeuxia* as our old *Calamagrostis*, or *Deschampsia* as the larger part of *Aira*, or *Agropyrum* as *Triticum* in part, or *Asprella* as *Gymnostichum*. It is a great pity that the government is so niggardly in the printing of such a pamphlet, for the typography and general "make-up" are very far from being what such work deserves. We understand that copies may be had upon application to Dr. Vasey.

Contributions to American Botany. XI. By Sereno Watson. I. List of Plants from S. W. Texas and N. Mexico, collected chiefly by Dr. E. Palmer, in 1879-80 (Gamopetalæ to Acotyledones). II. Descriptions of some new western species. Proc. Am. Acad. XVIII.

These annual contributions from the Botanic Gardens at Cambridge are always looked for with the greatest interest as containing the latest utterances of those who are best situated in this country to express an opinion in systematic botany. The principal part of the present contribution is devoted to a very interesting region, whose flora is comparatively unknown, and certainly very unusual. S. W. Texas and N. Mexico really share in that peculiar flora which has its beginning in S. Idaho, stretches through the Great Basin to Arizona and New Mexico, and so on to Texas and Mexico. Nearly fifty new species are described from Dr. Palmer's collection, and two new genera proposed. They both belong to the *Liliaceæ* and are named *Glyphosperma* and *Hemiphylacus*. The former belongs to Bentham's subtribe *Anthericeæ* and is "remarkable for the large colored stigmas, the peculiar filaments, the short dorsifixed anthers, the 1-nerved perianth segments, the pitted rugose seeds, and the terete fistulous leaves." The latter is intermediate between the *Chlorogaleæ* and the *Anthericeæ*, and is "characterized especially by the adnate filaments, only the inner and shorter ones antheriferous, and the scarious 1-nerved perianth-segments, in connection with the tuberous roots." Both were found near Saltillo. A synopsis

is also given of the genera and species of *Commelinaceæ* in the U. S., *Commelina* containing 5 species, *Tradescantia* 5, and *Tinantia* 1. The changes are that *C. Cayennensis* Rich. and *C. communis* of Chapman, become *C. nudiflora*, L.; *C. erecta* of Gray and Chapman is *C. hirtella*, Vahl., while *C. erecta*, L. still ranges from Penn. to Fla. An arrangement of the species of *Bouteloua* is also given, the 25 species being arranged under 4 sections, as proposed by Bentham. These sections are *Chondrosium* with 10 species, *Atheropogon* with 10; *Triathera* with 2, and *Polyodon* with 3. *B. Burkei*, Scribner, *B. Havardi*, Vasey, and *B. Texana*, Watson, are three species proposed as new. *B. curtipendula*, Torr. becomes *B. racemosa*, Lag. The Ferns are described by Prof. Eaton and among them are two new species of *Cheilanthes*. The Mosses were determined by the late Thos. P. James, and the very few lower cryptogams by Prof. Farlow.

In the second part, which occupies but five pages, are descriptions of some new western species, 19 in number, from Texas, New Mexico, Arizona, California and up the coast to Washington Territory.

Nouvelles Remarques sur la Nomenclature Botanique, par M. Alph. De Candolle. Genève, 1883.

This pamphlet of 80 pages contains discussions of subjects which have arisen since the author's publication, in 1867, of the "Lois de la nomenclature botanique," especial attention being devoted to Dall's report on "Nomenclature," etc., to the Nashville meeting of the A. A. A. S., in 1877; the report of M. Donvillé of the Geological Congress at Bologne, in 1881, upon the same subject; and the rules proposed by M. Chaper to the Zoölogical Society of France, in 1881.

The first part contains some observations and discussions upon various articles in the laws of 1867, the most important of which are concerning the point of departure for the law of priority, the citation of authors' names, both of species edited and inedited, and the names to be rejected or modified, and those which should be retained in spite of some defects.

The second part deals with new questions or those concerning which the Congress of 1867 was not specific, such as the nomenclature of organs, of fossils, of inferior groups or varieties, the use of capitals in the specific name.

The third and last part contains the text of the laws in full as adopted by the Congress, and indicates the proposed changes.

ARTICLES IN JOURNALS

ELLIS, J. B. & B. M. EVERHART.—New species of Fungi (6 species), *Torr. Bull.* 10. 76.
FARLOW, W. G.—Notes on some species in the third and eleventh centuries of Ellis' N. Am. Fungi, *Proc. Am. Acad.* 18. 65.
GRATACAP, L. P.—The growth of plants in acid solutions, I, *Am. Nat.* 17. 970.
GRAY, ASA.—Genera Plantarum by Bentham and Hooker (notice of the completion of the work), *Nation*. July 19, 1883; *Am. Jour. Sci.* 3. 26. 245.
GRAY, ASA and J. H. TRUMBULL.—Review of De Candolle's Origin of Cultivated Plants, with Annotations upon certain American Species (concluded from page 255 of Vol. XXV.), *Am. Jour. Sci.* 3. 26. 128.
HILL, E. J.—Means of Plant Dispersion, *Am. Nat.* 17. 811.
HOOPES, JOSIAH—Pinus Koraiensis, *Proc. Philad. Acad.* 1883. 114.
JONES, MARCUS E.—New plants from California, Nevada, etc., (6 species), *Am. Nat.* 17. 875 and 973.
MEEHAN, THOS.—Contraction of Vegetable Tissues under Frost, *Proc. Philad. Acad.* 1883. 74.
MEYER, A.—Review of his "Ueber Chlorophyll Körner, Stärkebildner und Farbkörper," by H. Marshall Ward, *Nature*, 28, 267.
MOHR, CHAS.—On Quercus Durandii, Buckley, *Proc. Philad. Acad.* 1883. 37.
NEWBERRY, J. S.—Notes on some Fossil Plants from Northern China, *Am. Jour. Sci.* 26. 123.
PECK, CHAS. H.—New species of Fungi (11 species), with plate, *Torr. Bull.* 10. 73.
SCHIMPER, A. W. F.—Review of his "Ueber die Entwickelung der Chlorophyllkörner und Farbkörper" by H. Marshall Ward, *Nature*, 28. 267.
SCRIBNER, F. LAMSON.—List of Grasses from Wash. Terr. (1 new species, Glyceria Canbyi), *Torr. Bull.* 10. 77.
TRASK, J. D.—Cases of Mushroom Poisoning, *Am. Jour. Med. Sci.* April, 1883.
TRUMBULL, J. HAMMOND.—See under GRAY above.
WATSON, SERENO.—Contributions to N. Am. Botany, XI (60 new species), *Proc. Am. Acad.* 18. 96.
WITTROCK, V. B.—Review of his "Snow and Ice Flora," by Mary P. Merrifield, *Nature*, 28 1304.

BOTANICAL GAZETTE.

VOL. VIII. OCTOBER, 1883. No. 10.

Enumeration of the Peronosporeæ of the United States.*

BY W. G. FARLOW.

In 1876 I published in the Bulletin of the Bussey Institution an account of the species of *Peronospora* and *Cystopus*, known at the time to occur in the United States, and the total number given was only ten. Having occasion recently to review the species of those genera in my collection, it occurred to me that, considering how many species have been added to our flora since 1876, it would be desirable to prepare a new list which should be as complete as the materials in my possession would permit, and, as the descriptions of some of the species are not accessible to many persons in this country who desire to study the subject, to add descriptions of all our species. The material examined has been specimens which I have collected myself and specimens in my herbarium, for which I am indebted to the kindness of several correspondents. In the arrangement of the synonymy I have endeavored to give the synonyms which are likely to be most frequently seen in text-books and agricultural treatises, and those who care for a detailed account of the synonymy of the more common species are referred to DeBary's original paper. Frequent references are made to American botanical works where our native species are mentioned; and where American specimens have been distributed in published exsiccati I have given the numbers, when they are known to me, without going so far as to quote European specimens of species which occur also in this country. The additions to our *Peronosporeæ* are mainly scattered through the reports of the New York State Botanist, Mr. C. H. Peck, and in the Bulletin of the Bussey Institution, and Ellis's North American Fungi Century III. contains a num-

* This paper was presented at the meeting of the Society for the Promotion of Agricultural Science at Minneapolis, Aug. 14, 1883, and is now printed with the permission of the President, Prof. W. J. Beale.

ber of dried specimens of our species. I have incorporated in the list the species mentioned by Harkness and Moore in their catalogue of the Pacific Coast Fungi,[1] although, with a few exceptions, I have not examined specimens myself, but have given them on the authority of Dr. Harkness.

Our exact knowledge of the development and systematic position of the *Peronosporeæ* dates from DeBary's classic monograph, *Recherches sur le développement de quelques champignons parasites*,[2] published in 1863, in which were described the greater part of our species. In a subsequent memoir, *Untersuchungen Ueber die Peronosporeen und Saprolegnieen*,[3] published in 1881, DeBary gives his views on the nature of the reproduction in *Peronosporeæ*, and their relation to allied orders of fungi, so that, except perhaps with regard to the germination of the oospores, there remains almost nothing to be studied in connection with the history of the development of this group of fungi.

In his last paper DeBary includes in the *Peronosporeæ* four genera: *Pythium*, *Phytophthora*, *Peronospora*, and *Cystopus*. In this country the species of *Pythium* have not been sufficiently studied, and no mention is made of them in this paper, although they possess a decided agricultural interest, since one species apparently causes what is known in some parts of the Eastern States as the potting bed fungus, which is very destructive to young house plants in the winter. Other species are known in decaying plants in damp ground. The species of the three remaining genera attack living plants, especially herbaceous exogens, and produce their oospores or resting spores in the interior of the leaves and young stems and bear their conidial spores on the surface. The oospores of all three genera are similar and produced in the same way, which can be learned from any of the recent text books of botany. They are globose and borne singly in an oogonium. They have two coats, the inner (Endospore) of which is first formed, while the outer (Exospore or Epispore) is formed, if one can say so, by a condensation of the surrounding protoplasm upon the endospore. In this way there is formed on the outer part of the oospore a covering which is either nearly smooth or marked with folds, ridges, or reticulations.

The three genera can not be distinguished from one another by their oospores, but the conidial spores serve to mark the

[1]Cal. Acad. Science, Feb. 2, 1880.
[2]Annales des Sciences Naturelles, 4 Série. T. 20.
[3]Beiträge zur Morphologie und Physiologie der Pilze. DeBary & Woronin. 4 Reihe.

genera in question. In *Phytophthora* and *Peronospora* the mycelium in the interior of the leaves makes its way to the surface, in most cases passing through the breathing pores. That part of the mycelium which passes into the air and bears the conidia is called the conidiophore. In *Phytophthora* it is a simple or branching filament, at whose tip or tips is formed an ovate cell, the conidium. Before the conidium falls from its attachment the conidiophore, at its base, swells on one side and then grows upward, pushing the conidium to one side so that it appears to have been formed by a lateral outgrowth. The elongated conidiophore then bears a new conidium at its tip, which is in turn pushed to one side by the growth of the conidiophore, as before The genus *Phytophthora* may then be recognized either by having one or more conidia borne laterally on the conidiophore, or, as is more frequently the case, by the swellings at intervals in the upper part of the conidiophore, indicating where conidia have fallen off.

In the genus *Peronospora* the conidiophore is a branching or rarely a simple filament which bears the conidia singly at the tips which do not afterwards elongate, as in *Phytophthora*. In a few species where the conidiophore is rather robust, instead of bearing a single conidium, the tip bears a number of short processes, or teeth, on each one of which is borne a conidium, as in *P. entospora* and *P. gangliformis.*

In *Cystopus* the mycelium, instead of passing through the stomata into the air, collects in spots under the epidermis, which is then ruptured and turned back, and the filaments which correspond to the conidiophores in the other genera are very short and stout, and densely packed together and grow into simple chains of conidia by transverse cell division. Hence, while *Phytophthora* and *Peronospora* appear to the naked eye like fine frost like patches, especially on the under surface of the leaves, species of *Cystopus* produce dead white spots not limited to the under surface of the leaves.

The species of *Phytophthora* and *Cystopus* are few in number and it is not necessary to subdivide these genera, but as there is a considerable number of species of *Peronospora* it is usual to subdivide the genus. The subdivisions made by DeBary depend upon the mode of germination of the conidia; in the first division he places the species whose conidia give off a number of zoospores in germination; in the second, including only two species, the whole contents of the conidia are discharged in a mass which is not however motile, but which at once pushes

forth a new filament; in the third the conidia send out filaments directly from the apex; and in the fourth they produce filaments from any part of the surface but especially laterally. These subdivisions are based on physiological rather than morphological grounds, it will be seen, but it may be added that there is a more or less closely corresponding morphological difference. In the first subdivision with zoospores the ramification of the conidiophores is pinnate, if we except the anomalous *P. entospora*, which does not branch at all, and the minute *P. pusilla*, which can hardly be said to branch. The second division includes only two small species in which the ramification is not well marked. The third and fourth divisions run into one another, since the species of the latter sometimes germinate at the tip. As it is, the third division includes only one but a very distinct species where the ramification is dichotomous, but the tips are swollen and bear a number of radiating sterigmata. The species of the fourth and largest division are dichotomous and in several cases so much alike that they can hardly be distinguished by the conidiophores alone. The haustoria of the different sections are, to a certain extent, characteristic. In the first section they are of the spheroidal type, while in the last two sections they are generally filiform or club shaped, and frequently branch. A species of *Peronospora* can be said to be satisfactorily known only when both conidia and oospores have been observed and the germination of the conidia ascertained. The germination of the oospores has been seen only in a very small number of species, and this element can not be used in the systematic classification of the genus.

In spite of the small number of known species of *Cystopus*, our species, it must be confessed, are as yet unsatisfactorily known. This arises principally from the fact that the conidia alone are not sufficiently characteristic, and on several hosts oospores have not yet been found. In some of the species the conidia are all alike in shape, and in germinating they give off zoospores. In others the terminal conidia of the chains differ in shape from the rest, and are said, on the authority of Tulasne, to germinate by means of an outgrowing tube instead of by zoospores. The conidia of species of *Cystopus* are of two types, the spherical and the cylindrical, or cuboidal as they are sometimes incorrectly termed, but, without a knowledge of the oospores as well, it is evident that one can not safely unite forms on widely different hosts, guided only by the ill-marked distinctions afforded by the conidia.

PHYTOPHTHORA DeBary.

Conidia at first solitary and terminal, but becoming lateral by the outgrowth of the tip of the conidiophore. Several conidia produced in succession. Germination by zoospores.

PH. INFESTANS (Mont.) DeBary. *Potato Rot.*

Botrytis infestans Mont., *Bot. devastatrix* Lib., *Peronospora devastatrix* Casp., *Peronospora infestans* Casp., DeBary et al.
EXS. Mycotheca Universalis no. 926.

Mycelium slender, without haustoria. Conidiophores simple or with a few irregularly placed branches, attenuated at the apex, with one or more nodosities below at the insertion of the conidia. Conidia ellipsoid or oval with a terminal papilla. Oospores?[1]

Common on cultivated potatoes from Maine to California (Harkness), and on tomatoes to South Carolina (Ravenel). Europe.

PERONOSPORA Corda.

Conidiophores variously branched or rarely simple, conidia always terminal. Germination either by zoospores or outgrowing tubes.

Plasmopara

SECTION I. ZOOSPORIPARÆ. Conidiophores pinnately branching, ultimate divisions often glomerate. Germination by zoospores.

Pl[illegible] viticola (B. & C.) Berl.

1. P. VITICOLA (Berk. & Curt.) DeBary.

Botrytis cana Schw. in Herb. Schweinitz non *B. cana* Lk.
Botr. viticola Berk. Crypt. Bot. 301; 23d Rept. N. Y. Bot. 61.
Per. viticola DeBary Ann. Sci. Nat. 4 Ser. T. XX. 121; Bull. Bussey Inst. I. 427; Grevillea III. 109, VI. 139. Bull. Ill. Mus. I. p. 55, pl. II. 687.
EXS. Mycotheca Universalis 617; Ellis North Am. Fung. 208; Ravenel Fung. Car. V. 60; Fung. Amer. 61.

Mycelium varicose, haustoria small, spherical. Conidiophores with a long, slender main axis, with a few short, subequal, alternate, horizontal 1 to 3 pinnate branches at the top. Tips acute, densely clustered in sets of usually three. Conidia small, ovoid-obtuse, average 17–23μ by 13–17μ. Oospores about 30–38μ, rather thin walled, yellowish, exospore smooth or slightly wrinkled.

Common on wild and cultivated grapes east of the Rocky Mts. Europe. Algiers. Appearing with us in midsummer and autumn.

NOTE.—Since the introduction of our grape mould into Europe an immense amount has been written on its progress and prevention. In this connection the reader is referred to the latest work on the subject: *Le Peronospora des Vignes*, by Dr. Max. Cornu, 1882, in which the bibliography is very fully given with admirable plates of the fungus.

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[1]The oospores of this species are unknown to DeBary. Mr. Worthington G. Smith, in Gardener's Chronicle, July 17, 1875, and Quart. Journ. Micros. Sci., October, 1875, reported the discovery of oospores, and in the last named journal gave photographic copies of his preparation. The discussion which took place on this subject has frequently been quoted in American journals, and those who wish to examine the question more fully should consult DeBary's *Researches into the nature of the Potato Fungus*, Jour. Royal Agric. Soc. of England, and the two papers of Mr. Smith previously mentioned.

Plasmopara Halstedii

2. P. HALSTEDII Farlow.

Proc. Am. Acad. XVIII. 72.
Exs. Ellis N. Am. Fung. 209, 210.

Mycelium with oval haustoria. Conidiophores rather stout, undivided below, above with numerous 1 to 4 pinnate horizontal branches, the lower of which are considerably longer and more compound than the upper. Tips long, slender, acute, loosely diverging. Conidia oval or elliptic, 19–30μ by 15–26μ. Oospores 23–30μ in diameter, yellowish, thin walled, exospore with a few folds or ridges.

On *Ambrosia artemisiæfolia*, *Eupatorium purpureum*, *Bidens frondosa*, *Rudbeckia laciniata*, *Silphium terebinthinaceum*, *Helianthus strumosus*, *H. doronicoides*, *H. tuberosus*, and *Solidago Canadensis*. Oospores on *H. doronicoides*.

From Mass. (Farlow) to Illinois (Burrill, Seymour), Iowa (Bessey, Arthur), Wisconsin (Trelease), and south to New Jersey (Ellis).

A widely diffused and apparently common species in the Northern States, but not yet reported from the Southern States. It may be expected to occur on almost any of the *Tubulifloræ* in midsummer and autumn. It can be distinguished from *P. viticola* by the more pyramidal outline of the conidiophores, the lower branches of which are usually decidedly longer than the upper, while in the ordinary forms of *P. viticola* the branches are all short, and by the longer less compact tips. The present species varies considerably, the form on *Helianthus* being very much branched and forming prominent woolly patches on the leaves, while in the form on *Ambrosia* the spots are minute and the branching less compound.

Plasmopara obducens

3. P. OBDUCENS Schroeter.

Hedwigia XVI. p. 129. Sept. 1877; Bull. Buss. Inst. II. 234; Proc. Am. Acad. XVIII. 70.
Exs. Ellis N. Am. Fung. 207.

Mycelium varicose, haustoria rather large, spheroidal. Conidiophores long and slender, branches slender, flexuous, loosely 2 to 3 pinnate, diverging in all directions, inserted rather acutely. Tips slender, acute. Conidia small, oval or ellipsoidal, 15–20μ by 12–15μ. Oospores 30–40μ in diameter, exospore yellowish, nearly smooth.

On *Impatiens fulva*.

Mass. (Farlow) to Illinois (Seymour) and Iowa (Bessey). Europe.

The species appears in the spring on the cotyledons, whose under side is densely covered by the conidia. Later in the season it forms small scattered spots on the leaves. The species is distinguished from the preceding by having the branches regularly arranged so that they diverge in all directions, while in the preceding they are very irregular, or with a tendency to a distichous arrangement. In this species the branches are not usually inserted at right angles, as in the preceding, but somewhat acutely. The tips are sharp and straight, but not so closely consolidated at the base as in related species.

Plasmopara Geranii
4. P. Geranii Peck.

28th Report N. Y. Bot. p. 63.
P. nivea Ung. var. Geranii Farlow Bull. Buss. Inst. I. 426; Proc. Am. Acad. XVIII. 73.
Exs. Ellis N. Am. Fung. 218.

Mycelium large, with oval haustoria. Conidiophores short and delicate, axis naked below, bearing at the tip a few short horizontal 1 to 2 pinnate branches. Tips long, slender, divergent. Conidia broadly ellipsoidal, 17–23μ by 15–18μ. Oospores 30–40μ in diameter, exospore yellowish-brown, somewhat rugose.

On *Geranium maculatum* (oospores), *G. Robertianum* and *G. Carolinianum*.

Mass. (Farlow), New York (Peck), Michigan (Spalding), to Wisconsin (Trelease).

Found throughout the summer, forming large patches between the principal veins, sometimes almost covering the whole under surface of the leaves and causing yellow discolorations of the upper surface. Hardly to be distinguished from *P. nivea*. Differing from the preceding members of the section in its shorter main axis, its short and at times very condensed branches with longer spreading tips.

I have received from Mr. F. S. Earle specimens collected on *G. Carolinianum*, at Cobden, Ill., which were very puzzling. The conidiophores were very irregularly branched and scanty, and there were two kinds of conidia, some of the size given above, and others very much larger, in fact, enormous. On examination the large conidia were found to be borne, not on the conidiophores proper, but in the following manner: The mycelium in the leaf made its way to the stoma, but instead of growing upwards and branching it at once expanded into one or two enormous conidia which appeared to be resting on a stoma. A similar condition has been described by Cornu in *P. viticola*, but his figure is not so striking as the specimens from Illinois. The latter were collected in April, and a similar condition also exists in *P. Violæ*, collected by Mr. Earle, also in April. It may be that this suppression of the ordinary conidiophore and the substitution of large sessile conidia is a common occurrence early in the season. In spite of their abnormal appearance I presume that the specimens on *G. Carolinianum* from Illinois probably are to be included under *P. Geranii*, but the scanty conidiophores did not present a typical appearance, but resembled somewhat those of *P. pusilla* Ung. Examination of a larger set of specimens is necessary to settle this form.

Plasmopara nivea
5. P. Nivea (Ung.) DeBary.

Botrytis nivea Unger Exanthem. 171.
Per. nivea Ung. Bot. Zeit. 1847, in part; DeBary l. c. 101. Pl. IV; Cat. Pacif. Fung. 29.
Per. Umbelliferarum Casp. Berlin Acad. Monatsber.

Haustoria obovate. Conidiophores short, bearing near the apex a few short horizontal 1 to 2 (rarely 3) pinnate branches. Tips subulate, straight, rarely subflexuous. Conidia subglobose, slightly papillate. Oospores large, with a pale yellowish-brown, smooth, or subrugose exospore.

On *Umbelliferæ*. California (Harkness). Europe.

This common form on *Umbelliferæ* in Europe is unknown to me in the United States, except from the catalogue of Harkness and Moore, on whose authority the species is inserted, the description being founded on European material.

Section II. BASIDIOPHORA. Conidiophores simple, surmounted by a number of sterigmata. Germination by zoospores.

Plasmopara entospora

6. P. ENTOSPORA (Cornu & Roze) B. & Br.

Basidiophora entospora Cornu & Roze Ann. Sci. Nat. 5me Série T. XI. p. 89. Pl. IV. f. 1-12.
P. entospora B. & Br. Grevillea, I. 20; Proc. Am. Acad. XVIII. 73.
P. Basidiophora Cornu Bull. Soc. Bot. France, XXV. 294.
P. simplex Peck, 31st Rept. N. Y. Bot. p. 45.

Conidiophores simple, stout, clavately swollen at the tip with numerous sterigmata on which are borne the very large, 26–32 η long, broadly ovate, papillate conidia. Oospores large, 34–41 μ in diameter, exospore marked with ridges.

On *Aster Novæ Angliæ*, *Erigeron Canadense* and *Solidago rigida*. Oospores on *Aster* and *Erigeron*.

New York (Peck) to Illinois (Burrill) and Wisconsin (Trelease). France, England, Germany.

Probably common in the United States, but first found in France, where it was probably introduced from America. It occurs from May to October, producing rather insignificant discolorations of the leaves. It has not yet been observed in New England. One of the most peculiar species of the genus, characterized by its simple conidiphores and very large conidia borne on sterigmata and perhaps rather to be regarded as a generic type.

Section III. PLASMATOPARÆ. Conidia white, in germination the whole contents being discharged and forming a free globose cell from which grows a tube.

Plasmopara pygmaea

7. P. PYGMÆA Unger.

De Bary l. c. Pl. VII. f. 10–15; Bull. Buss. Inst. II. 238; 29th Rept. N. Y. Bot. p. 5; 30th Rept. p. 77; Cat. Pacif. Fung. p. 29.
Exs. Myc. Univ. 921; Ellis N. Am. Fung. 211.

Mycelium large, haustoria small, obovate. Conidiophores short, stout, unbranched except close to the apex where there are a few rudimentary branches. Conidia ovate, 20–26 μ by 15–19 μ, papillate. Oospores large, dark brown, thick-walled, 45–53 μ in diameter, exospore slightly rugose.

On *Anemone nemorosa*, *A. Pennsylvanica*, and *Hepatica triloba*.

Mass. (Farlow), New York (Peck), Illinois (Seymour), to California (Harkness). Europe.

A common species on *A. nemorosa* in the Eastern States during the spring and early summer, often accompanying other fungi. I have been able to examine specimens on *A. nemorosa* only where the conidiophores are stout and scarcely branched at all. What is called by De Bary var. *elongata* I have not seen in this country.

BREMIA.

Section IV. ACROBLASTÆ. Conidia white, germinating by a terminal tube. Ramification dichotomous.

Bremia Lactucae, Regel.

8. P. GANGLIFORMIS (Berk.) De Bary.

Botrytis ganglioniformis Berk. Lond. Jour. Hort. Soc. I. 51. Pl. 4.
P. ganglioniformis Tul. Compt. Rend. XXXVIII, 26.
P. gangliformis De Bary l. c. Pl. VIII. f. 1-3; Bull. Buss. Inst. I. 427; Cat. Pacif. Fung. p. 29. Bull. Ill. Mus. I. p. 551, pl. II. 3.
Exs. Ellis N. Am. Fung, 219

Mycelium with ovate haustoria. Conidiophores simple below, slender, becoming several times dichotomous, the divisions often recurved, swelling at the tip into clavate or cup-shaped bodies from which radiate several sterigmata. Conidia small, globose or ellipsoidal, 16–23 μ by 16–20 μ. Oospores yellowish, thin walled, 26–34 μ in diameter. Exospore smooth.

On *Nabalus albus* (oospores), *Lactuca altissima, L. Canadensis, L. sativa,* and *Mulgedium leucophaeum.*

New Hampshire, Mass., New York (Farlow), Iowa (Bessey), Illinois (Burrill), to Wisconsin (Trelease). Europe.

A species easily recognized by the swollen or cup-shaped tips from which radiate a few sterigmata. It does considerable harm near Boston and New York to early lettuce raised in hot-beds. I have seen oospores on *Nabalus albus* only. The species is apparently common with us and will be found on several other hosts than those mentioned above. It has not yet been seen in this country on *Senecio vulgaris* on which it produces oospores in Europe.

PERONOSPORA, Corda

Section V. PLEUROBLASTÆ. Conidia white or violet colored. Germination by tubes given off from any part of the conidia, but especially the sides. Ramification dichotomous.

A. *Parasiticæ.* Wall of oogonium thick and rigid. Oospores with a thin, smooth exospore.

9. P. PARASITICA (P.) Tul.

Botrytis parasitica Persoon Observ. I. 96.
P. parasitica Tul. Compt. Rend.; De Bary l. c. p. 106, Pl. IX. f. 5–8; Bull. Buss. Inst. I. 428; 26th Rept. N. Y. Bot. p. 79; Cat. Pacif. Fung. p. 29.
P. Dentariæ Rabh. Fung. Eur. 86.
Exs. Ellis, N. Am. Fung. 212.

Mycelium large, with very large clavate or branching rootlike haustoria. Conidiophores stout and simple below, branching above, rather abruptly and irregularly dichotomous, the divisions dense, slender and flexuous. Tips subulate, curved. Conidia white, broadly ellipsoidal. Oospores 26–43 μ in diameter. Exospore brown and nearly smooth.

In *Capsella Bursa-pastoris, Lepidium Virginicum, Brassica sativa, Rhaphanus sativus, Cardamine rhomboidea,* and *Dentaria laciniata.* Oospores on *Cardamine* and *Dentaria.*

Mass. (Farlow), New York (Peck), to Delaware (Farlow), North Carolina (Curtis) and west to Wisconsin (Trelease), Kentucky (Kellerman) and California (Harkness). Europe.

A common species on *Cruciferæ* in all parts of the country, often in company with *Cystopus candidus,* on which it was once believed to be parasitic. It occasionally causes considerable damage to the cabbage crop. On *Lepidium* and *Capsella* it covers the under surface of the leaves with a dense fleece, but on

*a. Peronospora Calotheca, DeBary (see § Calotheca next page)
on Galium boreale
" Aparine

cabbages and *Cardamine* it is less dense. The oospores are not very frequent, considering how common the species is. Although subject to considerable variation, the species is comparatively easily recognized by the stout conidiophores which are abruptly dichotomous above, the divisions being slender and densely ramified. The haustoria are especially large and easily studied. The form on *Dentaria* from Kentucky corresponds precisely with Rabenhorst's original specimens of *P. Dentariæ*.

10. P. POTENTILLÆ De Bary.

De Bary l. c. p. 120; Bull. Buss. Inst. 233; Cat. Pacif. Fung. 29.
Exs. Ellis N. Am. Fung. 217.

Conidiophores slender, several times dichotomous, divisions distinctly flexuous. Tips attenuate, approximate in pairs, curved. Conidia violet colored, ellipsoidal, 20–26 μ by 15–19 μ. Oospores yellow, thin-walled, smooth, 22–24 μ in diameter.

On *P. Norvegica*.

Mass. (Farlow), California (Harkness). Europe.

As far as I am aware the oospores af this species have never been described. I found them on *P. Norvegica* in October, 1877. The oogonium is very thick-walled and rigid, and is almost completely filled by the oospore, which is almost exactly spherical and has a thin, smooth wall. In fact, at first sight, one would mistake the oogonium and its contents for a single thick-walled oospore so completely does the oospore fill the oogonium in most cases. In consequence of the structure of the oogonium, the present species must be placed in the same section as *P. parasitica* if we follow De Bary's classification. The species is common in Massachusetts from June to October. I have no specimens from the Western States, although I have heard that the fungus grows in that region!

In July, 1882, I found a *Peronospora* on *Geum album* at Wood's Holl, Mass., but it was not fully developed, and no oospores were seen. It formed ill-defined spots on the under side of the leaves, which showed a yellowish discoloration on the upper side. I presume that the form on *Geum* must be included in *P. Potentillæ*, although the conidiophores were more slender and less branched. At any rate, without more material, I should not venture to separate it as a distinct species.

11. P. CLAYTONIÆ n. sp.

Conidiophores long, naked below, several times dichotomous above, divisions short, flexuous. Tips short, subulate, widely spreading. Conidia broadly obovate, violet-colored, 22–24μ by 15–20μ. Oospores large, 38–45μ in diameter, brown, exospore more or less rugose.

On *Claytonia Virginica*.

Kentucky. Comm. J. B. Ellis.

The only specimens of this species which I have seen were those sent by Mr. Ellis. The leaves of the *Claytonia* were wrinkled and blackened, but no definite spots were found. The conidiophores were rather diffusely scattered, and the oogonia were large and did not contract around the spherical oospores,

which were brown, thin-walled and considerably smaller than the oogonia. The rigidity of the oogonium wall and other characters given above lead me to place the speeies in the present section, although it approaches the section *Effusæ*.

B. *Calothecæ*. Wall of oogonium thin, wrinkled at maturity. Exospore not smooth, but regularly tuberculose, verrucose, or reticulated. Haustoria filiform, branching.

12. P. MYOSOTIDIS DeBary.

DeBary l. c. p. 108. Pl. XIII, f. 5; Rabh. Fung. Eur. 572.

Conidiophores long, slender, several times dichotomous, ultimate divisions slender, widely spreading. Conidia ovate-obtuse 20–23μ by 15–18μ, faintly violet colored. Oospores rather small, 24–30μ in diameter, dark brown, exospore marked with regular reticulations.

On *Myosotis verna*.

Chebacco Lake, Mass. (Seymour), Cobden, Ill. (Earle). Europe.

Found on the leaves, especially the lower ones, in spring. Apparently not common. Recognized by the beautifully reticulated oospores which accompany the conidia in all the American specimens I have examined.

13. P. ARTHURI n. sp.

Conidiophores rather short and rigid, several times dichotomous. Tips rather short and rigid. Conidia broadly ellipsoidal, obtuse, 22–26μ by 19μ, slightly violet-colored. Oospores large, dark brown, 34–42μ in diameter, exospore covered with short blunt papillæ.

On *Œnothera biennis*.

Iowa (Arthur), Minnesota (Farlow).

This species, first detected by Prof. Arthur in Iowa, was found abundant on the shore of Lake Minnetonka, Minn. The fungus covers the under surface of the leaves in large patches, and the upper side of the leaves becomes pale yellow. The species is quite distinct from *P. Epilobii* Rabh., the conidiophores of which, as shown by Fung. Eur. no. 1747, are rather of the pinnate type, and whose conidia are not violet colored, but white. The papillate oospores also serve to distinguish the present from our other species. A form of *Peronospora* on *Œnothera* from New York is referred by Peck in his 30th Report to *P. effusa*.

14. P. VICIÆ (Berk.) DeBary.

This species, closely related to *P. Myosotidis*, and common in Europe on *Papilionaceæ*, is reported by Harkness and Moore to occur on pear leaves in California. It may, perhaps, be asked whether this is not a misprint for pea leaves. Certainly the species is not known elsewhere on pear leaves.

[TO BE CONTINUED.]

on p.327

Notes on Edible Plants. I.

RANUNCULACEÆ.

The natural order *Ranunculaceæ* includes in general plants of an acrid, caustic or poisonous nature, sometimes insipid, but often dangerous, and reference to their uses as poisons or in medicine are frequent. It has long been remarked, however, that the irritant principle has in general so little stability as to be expelled by heat, boiling or drying, and it may not exist in organs yet immature, hence various plants of this order have found use as aliments, as well as portions of the plant in which the dangerous substance does not appear to reside.

Among the species to which alimentary qualities have been ascribed are *Clematis flammula*, whose young shoots when boiled are said to be eaten (Maout & Decaisne); *Ranunculus auricomus* and *R. lanuginosus*, the leaves boiled and eaten (Duchesne); *R. bulbosus*, L., whose boiled leaves are edible (Lightfoot); *R. edulis*, Boiss., whose small tubers together with the young stems, leaves and blossoms, are brought to market in North Persia (Unger); *R. ficaria*, L., the pilewort, whose young leaves are boiled as a food by the Swedish peasantry (Linnæus); *R. repens*, L., the mildest of the genus, and said to be eaten as a pot-herb (Martyn); and *R. sceleratus*, L., which serves the shepherds of Wallachia as an edible after boiling (Don.), although Lindley says that beggars use its acrid leaves to produce ulcers and sores in order to excite compassion. *Caltha palustris*, in the Eastern United States, is a popular spring green, and under the name of cowslips is largely collected from the marshes about the villages of Massachusetts. Various species of *Nigella* produce pungent seeds, used as a condiment and a spice, as *N. arvensis*, L. (Don). *N. damascena*, L., is cultivated for its seeds in Turkey (Archer), and *N. sativa*, L., has been cultivated in Europe and the East, the seeds used for seasoning curries (A. Smith), as a pepper substitute in France (Guibort), and for spreading over bread and mixing with cakes by the Egyptians (A. Smith). *Aquilegia Canadensis*, L., var. *formosa*, Fisch., furnishes in its roots an aliment for the Indians of northwest America (R. Brown, Jr.), while *Pæonia albiflora*, Pal., furnishes food in its roots to the Tartars of Mongolia, who eat them after boiling, and also mix the powdered seeds with their tea (Pallas), and the same statement is made for *P. edulis* in Paradisus Londonensis.

—E. LEWIS STURTEVANT, M. D.

GENERAL NOTES.

Letter from Dr. Gray.—DEAR EDITOR: You will be glad to know and to announce to your readers that Dr. Englemann, who was, as the September *Gazette* says, "quite ill at Strasburg," has returned to us in good condition. When he came to us yesterday he showed no mark of illness nor lack of vigor.

Will you allow me to offer some remarks on your last issue? When a man has gone, he can not control the publication of his letters, nor can his friends, altogether. But I can imagine the distress with which the sensitive, modest and cautious Dr. Torrey would have read in print the youthful letter which your correspondent has sent you. I knew him intimately for forty years, and I can say that this letter of his is uncharacteristic. How young and inexperienced he then was may be seen from his statement that he and Mr. Knevels (which you have printed *Knevly*) had not time to write a flora with full description of the region thirty miles around New York that year, "so have put it off till next spring."

Do you think that botanists will approve your judgment, pronounced editorially and unqualifiedly, that "*it was very clearly shown that what must be considered as three distinct species of corn have been produced artificially?*" Is it really a scientific journal in which we read—not the announcement of discoveries made and laid before the world for judgment—but the announcement of discoveries which are going to be made? And in this wise:

"Really he is seeing incipient species springing up under his own manipulation, and can recognize the forces which are effecting the change. * * * Already has Dr. S. intimated certain results which will completely overturn and tear up by the roots some of our preconceived notions, and one of these days we may look for something startling." If I were in the place of the acute and zealous experimenter in question, I should deplore this kind of announcement, feeling that it would tend to create a prejudice against rather than in favor of the discoveries I had made, or was expecting to make.

Asking you to receive this volunteered counsel for whatever it may be worth, I remain truly your friend—A. GRAY.

Dr. Torrey's Letter.—The readers of the BOTANICAL GAZETTE are greatly indebted to Mr. Joseph F. James for the interesting undated letter from Dr. Torrey, which appeared in the last number. There is, however, evidence that the date assigned to it by Mr. James is too recent.

1. The "Lyceum of Natural History in the City of New York" spoken of in the letter, was incorporated April 20, 1818, but the society was formed in the latter part of February, 1817. A prefatory note prepared by Dr. Torrey for the Catalogue of Plants growing within thirty miles of New York, informs us that it was reported to the Lyceum Dec. 17, 1817, in pursuance of a resolution passed May 5, 1817. Dr. Torrey's allusion to "the society which we formed last winter," and to this catalogue as then in preparation, shows that the letter was written in the summer of 1817.

2. The first volume of Elliott's Sketch of the Botany of South Carolina and Georgia does indeed bear upon its title page the date of 1821, but we know that

it was issued in parts, at different dates, and as Dr. Torrey expressly says that he had received of the work as far as Pentandria Digynia, it is clear that he had only the first three parts. Dr. Gray (see his notes on the dates of issue of Elliott's sketch in *American Journal Science*, Series 3, Vol. 13, p. 81, 82,) has fixed the issue of Part III. as on or before April 3, 1817. This again would give the summer of 1817 as the period when the little circle of New York botanists were rejoicing over the possession of three parts of Elliott's work. At this time Dr. Torrey had just attained the age of twenty-one.

Such allusions as he had occasion in after years to make to Rafinesque's work, were even less complimentary than those of the letter.—J. H. R.

EDITORS GAZETTE:—Young botanists should all thank you for Dr. Torrey's letter, printed in the September GAZETTE. We all know his reputation as a cautious, careful, grand botanist, and he has been set off too long upon an unattainable pedestal. But now to find him a very enthusiastic and even rash young man is a revelation and a comfort. Yonng botanists who are so full of eagerness that they expect to do everything in short order and result in doing nothing well, should take courage, for enthusiasm may settle into love, and eagerness be turned into caution.*

Abnormal Anthemis Cotula.—A late flowering specimen of *Anthemis Cotula* presents an anomaly worth noting. The *disk-flowers* are entirely absent, and the head is composed of from 6–20 ligulate flowers arranged in the "double" fashion. These flowers are all *pistillate*, whereas the ray-flowers are usually neutral. The plant has about 30 heads, all showing the same peculiarity. None of its numerous neighbors were abnormal.—C. R. B.

Additional Note on Ustilagineæ.—In the August number of the GAZETTE reference was made to a *Doassansia* found growing on *Patamogeton* by Mr. Fletcher. At the time of writing, Cornu's paper, in which the genus was first described, had not been received in this country. Since then the number of the *Annales des Sciences* containing Cornu's description and plate, has come to hand. The genus is characterized by having globular masses of spores covered by a layer of dark ellipsoidal or prismatic cells. In germination the masses split open and the spores, thus set free, give out short tubes surmounted by a whorl of secondary cells resembling the germination in *Tilletia*. The species on *Potamogeton* has been recognized by De Bary as the *Sclerotium occultum* of H. Hoffman's Tab. Analyt. Fung. The type of the genus *Doassansia*, *D. alismatis* Cornu, was found on *Alisma Plantago* on an excursion to Lake Minnetonka during the meeting of the A. A. A. S. *Entyloma Menispermi* was also found in abundance near Hotel Lafayette. *Entyloma Lobeliæ* was found at Malden, Mass., by Mr. A. B. Seymour in July, and I have found it in several localities at Shelburne, N. H., so that the species is probably common in the East. In the proceedings of the Schlesische Gesellschaft for 1882, an *Entyloma Thalictri* is mentioned as a new species, found by Dr. Schroeter. I have not yet seen the description, but it is possible that it is to this species that the form on *Thalictrum*, found by Prof. Trelease, should be referred.—W. G. FARLOW.

Aquilegia longissima.—Apropos of Dr. Gray's note, it may be allowable to call attention to several of our American flowers with long, slender spurs, adapted to fertilization by the aid of *Aphingidæ*. Beside the long-spurred *Aquilegiæ*, which, despite the opinions of certain English writers on floral evolution, are more highly specialized than the European species of the genus, several flowers of this description occur in the West and Southwest. In the genus *Œnothera* there are not less than four such: *Œ. Missouriensis* (2–5′), *Œ. microsceles* (4–5′), *Œ. Jamesii* (3–5½′), and *Œ. cæspitosa* (2–7′). The flowers of *Macrosiphonia Berlandieri* are 3–5 inches long. *Mirabilis Wrightiana* reaches a length of 4½′; and *M. longiflora* 6½′; while over the line in Mexico, some of the species of *Nicotiana*, e. g. *N. longiflora*, reach a length of above three and a half inches.

These flowers require a longer proboscis than that of our common Eastern moths. Probably their most frequent visitor will be found to be *Amphonyx Antæus* Drury, one specimen of which, which was kindly examined for me by Mr. S. Henshaw, of the Boston Society of Natural History, had a tongue 5¾ inches long. It is quite probable that this length may be exceeded in other individuals.—WM. TRELEASE.

The Grasses of the U. S.—Allow me to say in response to your kind note in the last number of the GAZETTE, respecting the recent pamphlet on the Grasses of the United States, that it is somewhat experimental, and designed to call out information and criticism as well as to give needed assistance, especially to Western botanists. A few omissions have been already pointed out, as for instance, *Panicum virgatum*, L., and *Glyceria Canadensis*, Trin., also some typographical errors. There is also an omission of one genus, viz. *Scleropogon*, of which we have at least one species in Texas and the South-west, viz: *S. Karwinskianus*, Benth., which has been frequently distributed under the name of *Tricuspis monstrosa*, Munro. Any information respecting omissions, errors, or notes as to local names, uses, etc., will be thankfully received.—GEO. VASEY.

Abnormal Clematis.—I have just had handed to me by Prof. E. W. Blake, Jr., a branch of *Clematis*, probably *C. patens*, showing a peculiar abnormality. It is terminated by the usual large flower. The first foliage leaf has the petiole twisted, as usual, for climbing. Above this the leaflet, for there is but one, is expanded into a blade, about half of which is petaloid, while the rest is green. The plant was grown in New Haven.—W. W. BAILEY.

Erratum.—In my note on local names, in last issue, there occurs an *erratum*. For "mining berry" read "minnie-berry." But who ever reads a correction?—W. W. BAILEY.

EDITORIAL NOTES.

MR. BUCKLEY has just named a Texan oak for Dr. Vasey, being a shrub or small tree of the group of black oaks.

WE WOULD earnestly urge all botanists who have grievances against the Postoffice Department in reference to packages of specimens to state them very briefly to Dr. Farlow, of Cambridge, Mass., Prof. Bessey, of Ames, Iowa, or

Prof. Coulter, of Crawfordsville, Ind., who are preparing to address the authorities at Washington upon the subject.

MR. A. P. MORGAN has published the third installment of his Mycologic Flora of the Miami Valley, Ohio. The great genus *Agaricus* having been disposed of, the present pamphlet begins with *Coprinus* and ends with *Lenzites*. Two colored plates illustrate Mr. Morgan's new species, *Coprinus squamosus* and *Hygrophorus Lauræ*. We also note as new *Russula incarnata*, *Marasmius fagineus*, and *M. capillaris*. Of the 96 species described, Mr. Chas. Peck is responsible for 12.

THE AMERICAN JOURNAL OF SCIENCE seems to have had only its geologist at Minneapolis, and the report of the meeting, under the head of "Miscellaneous Scientific Intelligence," might as well have been included under "Geology." The statement that the "sections which had the largest number of papers were the geological and archæological," will not be sustained by the facts. The Geological section had 36 papers, Biology had 30, and Anthropology 25. The three papers of Prof. Cope, included in the report under the section of Geology, were referred to the section of Biology and read there.

THE TRANSLATION of Prof. Hermann Müller's "Die Befruchtung der Blumen durch Insekten," by Mr. D'Arcy Thompson, of Cambridge, England, is not only good service to the English speaking botanist who does not read German, but also to the many who do. The arrangement of the species in the translation is according to the system of Bentham & Hooker, instead of the German classification of the original. The preface is by Mr. Darwin, and is one of his last writings. The book is published by Macmillan & Co.

As we go to press we learn of the death of Dr. Müller, which occurred at Prad, in Tyrol, August 25. In him the world loses probably its chief authority in that department of natural history which deals with the mutual relations of insects and flowers. His works are vast storehouses of information, and will most probably always continue to be the principal source of information in their department. Dr. Gray says of him, in the October *Am. Jour. Sci.*, "By his most laborious and patient observations, by his great acuteness in interpretation and research, and by his studies of the modifications of insects in relation to flowers, no less than those of flowers to insects, he had placed himself at the head of this curious branch of biology, which was initiated by his countryman, Christian Conrad Sprengel, about one hundred years ago, resuscitated and more broadly based upon "the Knight-Darwin law," and the lead in which, since Darwin's death, is restored to Germany mainly by the researches of Hildebrand and Hermann Müller.

IN THE OCTOBER *Naturalist* Prof. Bessey gives the section divisions and principal synomymy of Lojacono's Revision of the N. Am. Trifolii, as published in the April number of *Nuovo Giornale Botanico Italiano*. We notice that Dr. Gray and Mr. Watson are each honored with a new California species, both cases being varieties raised to specific rank.

IN HIRAM SIBLEY'S *Grain and Farm Seeds Manual*, Dr. E. L. Sturtevant gives interesting histories of Indian corn, wheat, oats, barley, rye, buckwheat

and potatoes, and Prof. W. J. Beal has an illustrated paper on "Grasses," intended to give farmers some knowledge of the more common grasses they are likely to meet.

IT IS WITH a sense of personal loss that we record the death of Chas. F. Parker, curator of the Philadelphia Academy of Natural Sciences, which took place September 7. Mr. Parker was a bookbinder, being in charge of the binding department of *Godey's Lady's Book*, but as a botanist he was known in every herbarium of any pretension. His fine specimens of the famous New Jersey flora were always in demand, and no one had a more intimate knowledge of that region. His last days were spent in arranging the large herbarium of the Academy, and his friends write that the results were most satisfactory. Mr. Parker was one of the men that botanists hoped to meet next summer in Philadelphia, but his work remains as an humble but characteristic memorial of him.

J. E. TAYLOR, in *Science Gossip*, records the discovery of flies carrying away upon their feet the pollen masses from *Asclepias*, and it "struck him that it might be the method in which *Asclepias* is fertilized by insects," and he thereupon "suggests to North American botanists to examine" their various species of *Asclepias*, and see if insects are entangled, and have "pollen masses adhering to them." Where has Mr. Taylor been all these years? North American botanists were quick-sighted enough to discover this long ago, and even in some of our little Western colleges for several years the classes have been watching the insects at this work, and at the same time knew that they were examining what was common knowledge to every botanist in North America.

DR. JULIUS SACHS has just published a book entitled *Vorlesungen über Pflanzenphysiologie*, which is a series of lectures upon plant physiology, discussing the subject in a less formal way than his *Lehrbuch*. In reference to the latter, which has been so generally and constantly used in the German, French and English languages, it is interesting to hear the author expressing himself as follows: "As long as the artist is pleased with his work, he can add a touch here and there, or can even go in for greater changes; but this is not sufficient when the work has ceased to be the expression of his idea, and this is the attitude I stand in with regard to my text-book." This is given as a reason for not attempting another edition of the text-book, and makes English speaking botanists all the the more eager for a translation of the new work.

TWO THINGS STRUCK A NOVICE at Minneapolis rather unpleasantly in regard to the papers presented. The first was their careless preparation and still more careless presentation, half an hour being spent when five or ten minutes would have more than sufficed for a much clearer statement of all that was meant to be said. The second was the nature of the papers. Some were mere essays about well known facts, and most were observations about such trivial things that they could hardly be called profitable. While it may not be the object of the A. A. A. S. to cultivate a high degree of technicality, it should demand a certain amount of original work in the papers accepted.

TUCKAHOE, or Indian bread, is discussed at length by Prof. J. Howard Gore in the Smithsonian Report for 1881. Several things were eaten by the aborigines under this name, among them the underground portion of *Orontium aquaticum* and *Peltandra Virginica*, but it is now more generally applied to a fungus for which the name *Pachyma cocos* Fries is adopted.

LESTER F. WARD gives a systematic list and the distribution of 181 species of marsh and aquatic plants of the Northern United States, in signature 17 (vol. 3, p. 257) of the Bulletin of U. S. Fish Commission. Of this list 47 species printed in broad-face type are specially recommended by Dr. R. Hessel for carp ponds. It is noticeable that Dr. Hessel's list is wholly dicotyledonous, except *Naiadaceæ*, *Lemna*, *Pontederia*, and two rare plants, while both lists omit 8 out of the 11 kinds of plants named by Chas. W. Smiley, in answer to question 42—What plants are best for carp?—in signature 16, being such common plants as marsh marigold, water cress, white water-lilies, and Indian rice. Other less conspicuous omissions of flowering plants could be pointed out. No mention is made of *Chara* which in many western ponds and lakes is an important factor of the submerged vegetation. In some of the larger artificial lakes in the parks of Chicago it is so abundant as to require removal by dredging

DR. MOHN, of the Norwegian North Sea expedition, in his description (as given in *Nature*) of Jan Mayen Island, gives the following list of the plants collected: *Saxifraga cæspitosa*, L., *S. nivalis*, L., *S. oppositifolia*, L., *S. rivularis*, L., *Ranunculus glacialis*, L., *Halianthus peploides*, Fr., *Cerastium alpinum*, L., *Draba corymbosa*, R. Br., *Cochlearia officinalis*, L., *Oxyria digyna*, Campd., and *Catabrosa algida*, Fr.

DR. W. G. FARLOW summarizes the progress of botany during the year 1881 in an article of eighteen pages in the Smithsonian Report for that year lately issued. The first of these articles appeared in the preceding volume, embracing the years 1879 and 1880. They are excellent indices to the most important current literature in all departments of the science, and will be particularly valuable to ambitious workers who do not have access to a large scientific library.

THE LAST BULLETIN of the *Société Philomathique de Paris* contains an article by Roze on the male organs of *Azolla filiculoides*. The specimens were from the Botanic Garden of Bordeaux, and the first fruiting ones observed in France. The plants are monœcious, the conceptacles containing the male and female sporangia standing side by side. Each of the male or microsporangia contain six or seven cellular bodies or massulæ, in which the microspores are plunged, four in each. The massulæ contain a sufficient number of air cells, formed subsequently to the appearance of the microspores, to enable them to float on water The microspores do not escape, but, as in *Salvinia*, protrude the antheridia, the two terminal cells of which bear the antherozoids. These are quite similar to the antherozoids of *Salvinia*. It is now proven that all the vascular cryptogams have spiral antherozoids with two or more cilia anteriorly—several in *Azolla*—and a protoplasmic vesicle containing starch granules attached posteriorly. The archegonia have an interesting device mentioned by M. Roze.

The canal of the archegonium is terminated at itssummit by a delicate hyaline membrane forming a sort of funnel, which is covered on the inner surface by excessively fine filaments, doubtless for the purpose of facilitating the passage of the antherozoids into the archegonium. It will be remembered that the same end is attained in *Marsilia* by means of a mass of mucilage at the mouth of the archegonium which acts as a funnel.

PUCCINIA PROSERPINACÆ *Farlow* has been found very plentiful about Chicago, in so far confirming the opinion given in the last GAZETTE (ante p. 302) that it is widely distributed.

VOLKENS, by examining plants early in the morning, taking precautions against deception by dew, has found a large number of plants exuding water. He describes, in the "Proceedings" of the Royal Botanic Gardens of Berlin, the water pores of 150 species of plants. His observations were mostly made upon wild plants.

IN SOME REMARKS before the American Association at Minneapolis, Dr. Farlow mentioned the discovery this season of peculiar conidiospores on some *Peronosporæ* from Illinois. Instead of the usual branched aërial hyphæ bearing numerous small spores being produced, there were extremely short ones having a few spores of large size. The discovery is so recent that no opportunity has been given to study their development, and their office can not be conjectured.

THE WATER-NET, *Hydrodictyon utriculatum*, is a very common alga throughout Minnesota, Iowa and Illinois. It is to be found in shallow water, along the banks of rivers and small streams, and in pools having a constant supply of water kept warm by the sun, noticeably those in stone quarries. It is quickly recognized by the large, angular meshes reaching half a centimeter or more in diameter, seen best by raising the plant from the water. The old vesicular mother-cells, a centimeter or two long, still containing the young nets, look much like dead and bleached worms, as they lie undisturbed in the water.

THE LIFE HISTORY of *Penicillium*, common blue mould, will soon be issued from the botanical laboratory of the Johns Hopkins University.

AUGUST VOGEL, in Westermann's *Monatshefte* (translated in *Pop. Sci. Mo.* for Oct.) sums up what is known in regard to the pigments of plants, but unfortunately includes among them some things that we don't know. Light has a powerful, but not indispensable, influence in determining vegetable colors, and their intensity depends somewhat on the intensity of the light. Almost none of the flower pigments are available as dyes on account of their transitory nature. If Herr Vogel's translator interprets him correctly, the explanation given of the white color of flowers—"generally produced by a white cellular juice"—is wide of the mark. In Herr Vogel's opinion, tannin is an important factor in the generation of vegetable colors. He also believes that the form of the pigment exerts great influence on the shade of color.

THE CONTINUITY OF THE PROTOPLASM throughout the plant seems to be settled with tolerable certainty. W. Hillhouse has just added to our knowledge on the subject a fresh series of observations, conducted in Prof. Strasburger's

laboratory at Bonn. The most successful method is as follows: Very thin radial and tangential sections of the cortical tissue of various trees or shrubs were treated on the slide, first with dilute and then with concentrated sulphuric acid. After carefully removing the acid with a pipette, the sections were washed thoroughly with distilled water and covered with glycerine. By this treatment the cell-wall (and often the middle lamella) is destroyed, and the protoplasmic thread between adjacent cells distinctly seen. The material for this work is best gathered in January. Sections may be cut from fresh specimens or from those which have lain some days in absolute alcohol. In the first case, however, the razor must be flowing with absolute alcohol.

THE RECENT EXPERIMENTS of R. Hartig to determine the tissue through which water moves in the plant, and the causes of the movement, lead him to the following conclusions: There are two types of trees, in one of which (e. g. oak) the duramen is incapable of conducting water, and the other (e. g. birch) in which the whole of the wood is conductive. Tracheides, and at times true vessels, are the chief organs for the transference of sap. The absorption of water by the roots is due to the osmotic forces in its cells, especially those of the root-hairs. The cause of the ascent of water in wood is the difference in density of the air in the conducting organs, and the pressure of the atmosphere exercises little or no influence on it.

ARTICLES IN JOURNALS.

"ANALYST, AN."—A Granule of Starch, *Pop. Sci. Mo.* 23. 687.

BAKER, J. G.—A synopsis of the genus Selaginella (5 new species, all from Central and S. Am.), *Jour. Bot.* 21. 210: Ferns collected by the Rev. Hanning in E. Tropical Africa (two new species, an Asplenium and a Notochlæna), l. c. 245: A study of the survival of the fittest, l. c. 271.

BOSWELL, H.—Two recent additions to the British Mosses (one being Sphagnum Torreyanum, Sulliv.), *Jour. Bot.* 21. 233.

BUCKLEY, S. B.—Some new Texan plants (4 species, all shrubs or small trees, one being a Quercus), *Torr. Bull.* 10 90.

CHRISTY, ROBERT MILLER and HENRY CORDER.—Arum maculatum and its cross-fertilization, *Jour. Bot.* 21. 225 and 262.

CORDER, HENRY.—See under "CHRISTY" above.

ELLIS, J. B. and B. M. EVERHART.—New species of Fungi (7 species), *Torr. Bull.* 10. 89.

EVERHART, B. M.—See under "ELLIS" above.

GREENE, EDWARD LEE.—New Western Compositæ (9 species) *Torr. Bull.* 10. 86.

GROVE, W. B.—A new Puccinia, *Jour. Bot.* 21. 274.

HANCE, H. F.—Orchidaceas quattuor novas Sinenses, *Jour. Bot.* 21. 231: Heptadem Filicum Novarum Sinicarum (7 species), l. c. 257: Disporopsis, genus novum Liliacearum (from China), l. c. 278.

HEMSLEY, W. BOTTING.—Bermuda plants in the Sloane collection, British Museum, (with plate and description of a new Carex) *Jour. Bot.* 21. 257.

HILL, E. J.—Potamogetons in W. New York, *Torr. Bull.* 10. 92: Means of plant dispersion (continued from August number), *Am. Nat.* 17. 1028.

KIDD, H. W.—Notes on fasciated stems (with cut), *Sci. Gossip*, No. 225. 196.

PIM, GREENWOOD.—On Alliospora, a supposed new genus of Dematiei, *Jour. Bot.* 21. 334.

ROZE, E.—Male organ of Azolla filiculoides Lam., *Bull. Soc. Philom. de Paris*, Ser. 7. 7. 133.

SCRIBNER, F. LAMSON.—Notes on Spartina (with plate), *Torr. Bull.* 10. 85.

SEDGWICK, W. T.—Symbiosis and Vegetating Animals (Review of controversy between Brandt, Geddes, Lankester et al.), *Pop. Sci. Mo.* 23 811.

TRELEASE, W.—Notice of Farlow's notes on Ellis' N. Am. Fungi, *Science*, 2. 410.

VOGEL, AUGUST.—The colors of flowers (considered chemically), *Pop. Sci. Mo.* 23. 837.

WARD, LESTER F.—Marsh and aquatic plants of the Northern U. S., many of which are suitable for carp ponds, *Bull. U. S. Fish Com.* 3. 257.

BOTANICAL GAZETTE.

VOL. VIII. NOVEMBER, 1883. No. 11.

Notes on Edible Plants. II.

DILLENIACEÆ.

The Water-tree of Sierra Leone is *Tetracera alnifolia*, so called on account of its climbing stems yielding a good supply of clear water when cut across (A. Smith). The fruit of most of the species of *Dillenia* are acid, and are used by the natives of India in their curries, while the enlarged fleshy calyx of the ripe fruit is used in the preparation of acid beverages and in stews. *D. elliptica*, Thunb., has fruit the size of an orange, sub-mucilaginous, and eaten in the Eastern Archipelago (Unger); *D. pentagyna*, Roxb., has flower-buds and round fruit of a pleasant acid flavor, which, as well as the ripe fruit, are eaten raw or cooked in Oudh and the Central Provinces of India (Brandis); in Chittagong the fleshy calyx leaves of *D. scabrella*, Wall., of a pleasant acid taste, are eaten in curries (Wallich), while in Burmah the fruit of *D. scabra* is brought to the bazaars while green, and is considered a favorite vegetable (Mason); *D. serrata*, Thunb., furnishes a mucilaginous and sub acid fruit in the Eastern Archipelago, while in India the large thickened calyices of the fruits of *D. speciosa* are gathered for use, cooked with sugar, as a sauce (Firminger). The acid juice of the fruit also serves the natives as a vinegar (Pickering). In Japan *Actinidia arguta*, a vine common about Yesso, bears an oblong greenish berry about an inch in length. The pulp is of uniform texture, the seeds minute and the skin thin. When ripe

it possesses a very delicate flavor. *A. polygama*, of Northern Japan, is somewhat less desirable, as fruiting less abundantly, but the fruit is equally serviceable (Penhallow).

CALYCANTHACEÆ.

Of this small family, *Calycanthus floridus*, L., seems the only species which can be classed among aliments. The aromatic bark of this is said to be used as a cinnamon substitute in the Southern United States (A. A. Black), but by other authors the use is as a substitute for cinnamon for flavoring medical decoctions (Baillon).

MAGNOLIACEÆ.

The bark of *Drimys Granatensis*, L. fil. var. *montana*, St. Hil., is used in Brazil as a seasoning (Don). *Illicium anisatum*, L, is the Star or Chinese Anise. The fruit, about an inch in diameter, forms an article of commerce. In Germany, France and Italy it is used largely to flavor spirits (Pharmacographia), the Mahometans use it for seasoning (Ainslie), and the Chinese mix it with tea and coffee to improve the flavor (Loudon). The flowers of *Talauma Plumiera*, Serz., find use by the distillers of Martinique for flavoring liquors (A. Rich). The root of *Liriodendron tulipifera* is used in Northern America in flavoring spruce beer. The flower-buds of *Magnolia conspicua*, Salisb., are pickled by the Chinese, and used for flavoring rice, and in Devonshire, England, the flowers are said to be pickled, and are pronounced of exquisite flavor (Loudon). In China the flowers of *M. Yulan* are said to give an aroma to tea, and the buds are pickled in vinegar (Baillon). The fruit of *Michelia champaca*, L., is said to be edible, and the tree is celebrated in India for the exquisite perfume of its flowers (Don). The fruit of *Schizandra grandiflora*, H. f. and Th. is eaten in Sikkim, the large fleshy red drupes being pleasantly acid (Hooker).

Enumeration of the Peronosporeæ of the United States.

BY W. G. FARLOW.

(Continued from p. 315.)

C. *Effusæ.* Wall of oogonium thin, corrugated at maturity. Exospore thick, with a few irregular folds, which are sometimes adherent to the wall of the oogonium.

15. P. EFFUSA (Grev.) Rabh.

Botrytis effusa Grev. F .Edin. 468.
P. effusa Rabh. in Klotzsch Herb. Myc. no. 1880; De Bary l. c. p. 112 Pl. VIII. f. 7, XIII. f. 11; Bull. Buss. Inst. I. 428; 29th Rept. N. Y. Bot. 52; 30th Rept. 77; Cat. Pac. Fung. 29.
P. Chenopodii Casp. Bot. Zeit. 1854.
Exs. Ellis N. A. F. 213.

Conidiophores short, stout, several times dichotomous. Conidia broadly ellipsoid, violet colored, very variable in size, 22–30μ by 19–23μ, often pedicellate. Oospores 26–35μ in diameter, exospore dark brown, irregularly ridged.

Var. MAJOR. Tips thick, short, subulate, reflexed. Conidia ellipsoid, distinctly pedicellate.

Var. MINOR. Narrow, lower divisions suberect, tips subulate, erect, slightly curved Conidia globose-ovoid, not distinctly pedicellate.

On *Chenopodium album*, *Atriplex hastata*, and *Spinacia oleracea*.

Mass. to Iowa, Wisconsin and California. Europe.

A coarse, common species, forming a dirty white or cinereous felt on the under side of the leaves of *Chenopodium album* and other species during the whole season. We have both forms mentioned by De Bary, but with us the slender form occurs on *Chenopodium*, and I have seen the stouter form on *Atriplex*. Oospores are abundant on *Chenopodium*, but I have not yet seen them on *Atriplex*.

NOTE.—The following three forms are very closely related to *P. effusa*, and it is scarcely possible to state any distinct points of specific difference. As they occur on hosts belonging to other orders than *Chenopodiaceæ*, they have received distinct specific names, under which they are enumerated below.

16. P. POLYGONI Thuemen, in Verhandl. Zool. Bot. Gesell. Vienna, 1874.

Conidiophores more slender, tips shorter and straighter than in typical *P. effusa*. Conidia violet colored, without pedicels. Oospores as in *P. effusa*.

On *Polygonum dumetorum* var. *scandens*, Kentucky (comm. Ellis), Iowa (Arthur). Europe.

Forming small and rather inconspicuous patches on the under side of the leaves. The Kentucky specimens contain oospores, and the conidiophores are precisely like those of the form on *P. aviculare*, of which I have examined specimens from Herb. Thuemen.

17. P. ALTA Fuckel.

P. Alta Fung. Rhen. no. 39; Symb. Myc. 71; De Bary l. c. 119: 30th Rept. N. Y. Bot. 56, 77.
P. effusa var. *Plantaginis* Farlow Bull. Buss. Inst. I. 428.
Exs. Ellis N. A. F. 214.

Conidiophores and oospores closely resembling those of slender forms of *P. effusa.*

On *Plantago major.*

From New Hampshire (Farlow) to Wisconsin (Trelease). Europe.

One of our commonest forms at least in the East. It forms dirty-white patches of considerable extent, sometimes almost covering the whole under surface of the leaves. Oospores are especially abundant in this form as found in New England, but they can not be distinguished from those of *P. effusa.* Found during the whole season.

18. P. VIOLÆ De Bary.

P. Violæ De Bary l. c. 121.
P. effusa var. *Violæ* Rabh. Fung. Eur. no. 1368.

Conidiophores and oospores closely resembling those of *P. effusa* var. *major.*

On *Viola tricolor* var. *arvensis.*

Cobden Ill. (Earle). Europe.

The specimens received from Mr. Earle were collected in April, 1883, and can be referred without doubt to this form, from their resemblance to *P. effusa* var. *major.* Reference has already been made, under *P. Geranii,* to a peculiar monstrous form of conidia found by Mr. Earle on that species as well as the present. Although enormously developed the abnormal conidia retain the shape and violet color as well as the marked pedicels of the normal form. Schroeter, in Hedwigia, XVI., 132, states that the oospores of *P. Violæ* are like those of *P. effusa.* No oospores were found in the Illinois specimens.

19. P. URTICÆ (Lib.) De Bary.

Botrytis Urticæ Libert MSS.; Berkeley Journ. Hort. Soc. London I. 31.
P. Urticæ De Bary l. c. 112; Cat. Pac. Fung. 30.

"Conidiophores short, loosely 4–6 dichotomous; divisions flexuous, tips subulate, arcuate, often deflexed Conidia large, broadly ovoid or subglobose, distinctly pedicellate; apex very obtuse; membrane pale violet. Oospores medium sized, exospore dark colored."—*De Bary l. c.*

On nettles.

California (Harkness). Europe.

I have not examined American specimens of this species, which is inserted on the authority of Harkness and Moore. The description is taken from De Bary.

20. P. FICARIÆ Tul.

Comptes Rendus 1854; De Bary l. c. 113; Bull. Buss. Inst. II. 233; Cat. Pac. Fung. 29.
Exs. Ellis N. A. F. 215.

Conidiophores rather short and slender, several times dichotomous, tips usually straight, spinose, spreading. Conidia violet,

ovate-obtuse or ellipsoid 20–26μ by 16–20μ. Oospores rather small, 22–32μ in diam., yellowish brown, exospore smooth.

On *Ranunculus acris* and *R. bulbosus*.

Massachusetts (Farlow), California (Harkness). Europe.

One of the commonest species in the East, especially early in the season, but certainly less common in the West, from which region I have not seen any specimens, although the species is said to occur there. It covers the whole under surface of the leaves with a dense down, and oospores are frequently found in the hosts mentioned above. Our form is decidedly more luxuriant than that found on *R. Ficaria* in Europe.

21. P. TRIFOLIORUM De Bary.

De Bary l. c. p. 113; Cat. Pac. Fung. p. 29.

Conidiophores rather slender, several times dichotomous, divisions spreading and flexuous, tips acutely subulate, divergent, conidia broadly elliptic, obtuse, 19–26μ by 15–19μ, violet colored. Oospores 26–34μ in diam., thick walled, exospore dark brown, nearly smooth.

On *Astragalus Canadensis*.

Iowa (Arthur), Minnesota (Farlow), California on clover (Harkness). Europe.

To this species should be referred a form common in Iowa and Minnesota on *Astragalus Canadensis*. It forms dirty-white patches on the under surface of the leaves, the upper surface of which becomes more or less yellow. Our form on *Astragalus* is more luxuriant than any of the European forms of the species which I have examined, and oospores are frequently found. I have not examined California specimens In spite of their more luxuriant growth I can see no specific difference either in the conidia or oospores by which one could separate our plant from that of Europe.

22. P. CORYDALIS De Bary.

De Bary l. c. 107.

Conidiophores slender, simple below, above several times dichotomous, divisions flexuous. Tips slender, elongated, curved. Conidia broadly ovate, 20–24μ by 16–20μ, pale violet colored. Oospores 26.5–43μ in diameter, exospore brown, slightly rugose.

On *Dicentra*.

Buffalo, N. Y. (Clinton). Europe.

This species covers the whole under surface of the leave with a dirty-white down, and in all specimens which I have examined the oospores have been very abundant. Mr. Clinton informs me that the host is *D. Canadensis* or *D. Cucullaria*, and that the fungus perhaps occurs on both species. Our fungus agrees well with European specimens as far as the conidiophores and conidia are concerned, but the walls of the oogonia are not thick and rigid, but easily collapse, and on this account the species is here inserted with the *Effusa*. American specimens do not so well agree with the European *P. affinis* Rossm. as far as their conidia are concerned, although the oogonia resemble those of the last named species In examining a considerable number of specimens of *P. Corydalis* and *P. affinis*

determined by European authorities the oospores of the two species hardly seemed to present differences sufficiently striking to warrant, on that ground alone, placing them in different sections of the genus.

23. P. Euphorbiæ Fuckel.

P. Euphorbiæ Fung. Rhenan. no. 40. De Bary l. c. 114.
P. Cyparissiæ Farlow in Bull. Buss. Inst. II. 236.
Exs. Ellis N. A. F. 216.

Conidiophores repeatedly dichotomous, divisions flexuous, tips widely spreading, spinose, straight or sometimes curved. Conidia globose or ellipsoidal 13–16μ by 16–19μ, pale violet colored when mature. Oospores 23–33μ in diam., exospore brown, thick, and irregular.

On *Euphorbia maculata*.

Mass. (Farlow), New Jersey (Ellis). Europe.

Forming rather diffuse patches of a dirty-white color on the under side of the leaves, the upper surface remaining nearly normal. The species is apparently not common. I have occasionally seen it about Cambridge, but never in quantity except in the unusually wet summer of 1878, when it was common on *E. maculata*, in the college grounds, in August. I have compared our plant with European specimens of *P. Euphorbiæ*, and it seems to me that they specifically agree, although some minor points of difference are present. The conidia of American specimens are certainly violet colored, but, although those of the European form are described as colorless, I have found them to be violet in specimens on *E. platyphylla*. About the oospores of this species writers do not all agree. They are commonly found with us and have a thick brown exospore with irregular projections. The oosporic wall is rather rigid and thick, and, if I am not mistaken, has two layers, so that it bears as much resemblance to the oospores of the *Parasiticæ* as to those of the *Effusæ*. *P. Euphorbiæ* Fuckel, and *P. Cyparissiæ* De Bary, are generally kept distinct, but I must confess that an examination of a good set of both species leads me to think that one is probably a more fully developed form of the other. The form on *P. Cyparissias* is not known to me in America.

24. P. GRISEA Unger.

Botrytis grisea Unger Exanthem. 172.
P grisea Unger Bot. Zeit. 1847, 315; De Bary l. c. 115, Pl. XIII. f. 12.

Conidiophores slender, several times dichotomous. Tips flexuous, approximate or slightly spreading. Conidia ovate-obtuse, violet colored, 22–30μ by 15–22μ. Oospores large, 30–38μ in diam., exospore brown.

On *Veronica alpina*.

Tuckerman's Ravine, Mt. Washington. Europe.

I have found this species but once, and then at the head of Tuckerman's Ravine, in the month of September, when oospores as well as conidia were present. Of our Eastern species this attains the highest altitude, reaching to 4,500 feet above the sea-level.

25. P. LINARIÆ Fuckel.

Fungi Rhenani 1903; Symb. Myc. 70.

Conidiophores slender, several times dichotomous. Tips short, flexuous, approximate. Conidia obovate, distinctly attenuated at the base, 26–33μ by 12–16μ, violet. Oospores 30–34μ, thick-walled, exospore dark, rough.

On *Linaria Canadensis.*

Chebacco Lake. Mass. (Seymour).

Apparently a rare species collected in June by Mr. A. B. Seymour. It forms a scanty growth of a dirty white color on the under side of the leaves, in which the oospores abound. The conidia of this species are different in shape from those of our other species and resemble those of *P. Schleideniana.* They are narrowly obovate and much attenuated at the base. The oospores are rather large and thick-walled, the exospore having more prominent ridges than in the related species.

26. P. LEPTOSPERMA De Bary.

De Bary l. c. p. 117, Pl. IX. f. 1, 2.

Mycelium with globose haustoria. Conidiophores rather stout and rigid, several times dichotomous, occasionally trichotomous, divisions straight, divergent above. Tips short, spinose, erect. Conidia large, rather narrowly ellipsoid, obtuse, 31–45μ long by 16–22μ broad, white. Oospores yellowish-brown, about 38–45μ in diameter, exospore smooth or with a few folds.

On *Artemisia biennis.*

Lake Minnetonka, Minn. Europe.

As far as I know the only locality in which this species has yet been found in this country, but it is to be expected on other composites, especially *Tanacetum.* The portions of the leaves attacked quickly shrivel and blacken. I found no oospores on my specimens, and the measurement given above was taken from European specimens. In all other respects the fungus seems to me to be undoubtedly the same as the European type, and is recognized by the rigid spinose tips and the large white narrowly eliptical conidia. *P. Radii* De Bary, which sometimes accompanies the present species in Europe, has not yet been found in this country.

SPECIES WHOSE OOSPORES ARE UNKNOWN.

a· *Conidiophores pinnately branched.*

27. P. SICYICOLA Trelease in litt.

Haustoria not seen. Conidiophores slender, axis long and flexuous, with very numerous 3–4 pinnate, slender, horizontal branches, alternately or frequently oppositely placed. Tips divided into several, usually three, very short spines. Conidia small 13–17μ by 11–15μ ovoid, white. Oospores ?

On *Sicyos angulatus.*

Near Madison, Wis. (Trelease).

This very interesting species was discovered by Prof. Trelease in the sum-

mer of 1882. It forms rather small, scattered, frost-like spots on the under side of the leaves. The resemblance to *P. viticola* and *P. Halstedii* is striking. The present species, however, has conidiophores whose branches are more fully developed than in those species, although the general plan of the ramification is the same. Although the germination of the conidia has not yet been seen, one can not help thinking that they will prove to germinate by zoospores, so great is the resemblance of the conidia and conidiophores to those of our species of the section *Zoosporiparæ*. In the Journ. Linn. Soc. X., 363, Berkeley and Curtis describe a *Peronospora Cubensis* found by Charles Wright on some cucurbitaceous plant in Cuba, which, as far as I have been able to ascertain, is not the same as the present species, judging from the description given. The description is as follows: "Candida; floccis sursum furcatis; ramulis ultimis rectis nec uncinatis, sporis metulæformibus vel oblongis obtusis." An examination of the type in the Curtis collection, where it bears the name *Botrytis Cubensis* B. & C., shows only a minute *Ramularia*, which throws no light on the subject. Whether correct or not in assuming that *P. sicyicola* is distinct from *P. Cubensis*, the discovery of the species in Wisconsin is of economic importance. If it occurs in *Sicyos* it may be found on cucumbers, melons, and other *Cucurbitaceæ* at some future date, and it may eventually prove injurious to garden crops. Like others of our pinnate species it may, sooner or later, spread eastward, and, following the example of *P. viticola*, in time extend even to Europe. I have examined cultivated plants of *Sicyos* in Cambridge, but have been unable to find the *Peronospora*. *Echinocystis* should also be watched, for, from its close relationship to *Sicyos*, it is not unlikely that the fungus will be found upon it. A more detailed account of *P. sicyicola* will be given by the discoverer in another place, and it is to be hoped that he will be able to succeed in observing the germination of the conidia, and ascertain whether the resemblance to *P. viticola* is preserved in this point also.

28. P. Illinoensis.

Conidiophores slender, scattered, loosely 2–3 pinnate above, secondary branches usually horizontal, sometimes secund. Tips acute, short, erect, clustered. Conidia globose, or ovate-obtuse, white, 17–20μ by 15–18μ. Oospores?

The above unsatisfactory diagnosis is given temporarily to designate a curious form found on some leaves of *Parietaria Pennsylvanica* received from Prof. T. J. Burrill. They were collected, I believe, in Southern Ill., by Mr. A. B. Seymour. As will be seen from the description this is another of the pinnate forms which are characteristic of this country. A *Peronospora Parietariæ* is mentioned by Roumeguère in the Revue Mycologique for July, 1883, and distributed in Fungi Gallici no. 2553. It was found on *Parietaria diffusa* at Chailly, France. I have not yet seen a description of the species which is said by Roumeguère to be *P. Urticæ* pro parte. From this statement one can only assume that the Illinois form is not *P. Parietariæ* Roum. for the former is distinctly pinnate, while the latter, if *P. Urticæ* pro parte, must be assumed to be dichotomous. Unfortunately in my copy of Fungi Gallici the specimen no 2553 only shows a *Ramularia*, and

I am not at present able to state certainly whether the American plant is *P. Parietariæ*, although it probably is not. Our species is probably of limited range, and we must look to Prof. Burrill to discover the oospores and the mode of germination of the conidia. Here again the resemblance to the other pinnate species would lead us to suspect germination by means of zoospores.

b. *Conidiophores dichotomous.*

29. P. SORDIDA Berk.

Ann. & Mag. Nat. Hist. 1861, 449; Cat. Pac. Fung. 29.

"Forming broad, irregular, dirty, pallid spots on the under side of the leaves; threads loosely dichotomous above; tips forked, unequal; spores obovate, apiculate, .001 inch long." Berkley l. c.

On *Scrophularia Californica.*

California (Harkness). Europe.

30. P. SPARSA Berk.

Gardener's Chronicle 1862 p. 308; Cat. Pac. Fung. 29.

Conidiophores scattered, repeatedly dichotomous. Conidia ellipsoid, apex obtuse.

On *Rosa Californica.*

California (Harkness). Europe.

31. P. LOPHANTHI.

Conidiophores very slender, long, naked below, above repeatedly dichotomous, divisions flexuous. Tips flexuous, forcipate, one division usually considerably longer than the other. Conidia small, globose, or ovate-obtuse, 19–22μ by 15–20μ, violet colored. Oospores ?

On *Lophanthus scrophulariæfolius.*

Charles City, Iowa. (Arthur.)

This species, which has only been collected by Prof. Arthur, forms small, dirty-white patches on the under side of the leaves. It differs from *P. Lamii* A. Br. in being much more slender and in not having pedicellate conidia. Its relation to *P. Calaminthæ* Fuckel requires further study, and one needs to see the oospores before concluding that the species is a good one. The conidiophores are more slender and longer than in most of our species, in this respect resembling the form on *Geum*. The tips are bifurcate, one division usually being much shorter than the other.

The above includes all our species of *Peronospora*, about which I have as yet direct information. There are, however, several more species known to others, I believe. The list of our species is by no means meagre, and it will probably soon be increased, now that a number of observers are in the field. I have already, in a previous paper, called attention to the fact that our flora is characterized by the abundance of species whose conidia germinate by zoospores, and if, as is not unlikely, it should prove that the species on *Sicyos* and *Parietaria* also produce zoospores, the proportion would be still greater. Our *Peronospora* may be divided into two groups, those in which the ramification is pinnate and those in which it is dichotomous. In each group there are species which closely resemble one another, and one is tempted to ask how far the different forms described are really specifically distinct. Of the pinnate group, although we

might suppose that the greater part of the species were derived from some common ancestor, yet, as species of fungi go, they are now comparatively distinct. The same can not be said of the group *Effusæ*. I have already noticed several forms which it seems to some botanists can not be morphologically distinguished from *P. effusa*, and, in general, all of the *Effusæ* are closely related to one another. Some mycologists maintain that two forms morphologically alike must, if they grow on hosts belonging to natural orders which are not closely related, be regarded as distinct species. I am unwilling to adopt this view so long as repeated attempts have not shown that it is impossible to transfer a *Peronospora* on one host to a host of an order not nearly related. Cultures are to be recommended to persons who have a certain amount of leisure, and they do not require an elaborate equipment or special library. One might, for instance, attempt to transfer the form on *Plantago* to *Chenopodium*, or vice versa.

In my enumeration it will be noticed that no mention is made of species on *Caryophyllaceæ*, although several are found in Europe. I believe that species of *Stellaria* and *Cerastium* are attacked by *Peronosporeæ* in the Western States, but a careful search in Massachusetts has failed to detect any *Peronospora* on such hosts, although *Isariopsis pusilla* Fres., which externally resembles a *Peronospora*, is common. It is hardly probable that we do not have some of the *Calotheceæ* which inhabit *Caryophyllaceæ*. *P. Schleideniana* Ung., on onions, and *P. Schachtii* Fuckel, on beets, have not yet been observed in the United States as far as known, but they may be expected.[1]

CYSTOPUS Lév.

Conidia white, spherical or cylindrical, in moniliform chains densely packed side by side, forming spots surrounded by the ruptured epidermis. Germination by zoospores.[2]

32. C. CANDIDUS (P.) Lév.

Uredo candida Persoon Syn. Fung. 233; Schweinitz Fung. Am. Bor. no. 2852 in part.
C. candidus Lév. Ann. Sci. Nat. Ser. 3, VIII; De Bary l. c. 126 Pl. I. & II. f. 1–3; Bull. Buss. Inst. I., 429; 29th Rept. N. Y. Bot. 76; Cat. Pac. Fung. 26; Bull. Ill. Mus. I., 57, Pl. I. f. 1–4.
Exs. Ellis N. A. F. no. 201; Ravenel Fung. Car. IV. 96.

Conidia all alike, globose, white. Oospores nearly spherical, yellowish brown. Exospore marked with few, very prominent, flexuoas ridges which sometimes branch.

On *Capsella bursa-pastoris*, *Lepidium Virginicum*, *Dentaria diphylla*, *Sinapis*

[1] While attending the session of the American Association at Minneapolis last August I found the leaves of *Ampelopsis quinquefolia* growing on the shores of Lake Minnetonka, attacked by *P. viticola*. The spots formed were small and scattered, and the fungus not so well developed as when growing on grapes. Strange to say the plants of *Vitis riparia* growing close to the *Ampelopsis* were free from the *Peronospora*, and during all my excursions near Minneapolis I found no *Peronospora* on wild grapes. This indicates that the fungus is less common in the Northwest than in the East, where the fungus abounds on all grapes. On the other hand *P. viticola* has not been found on *Ampelopsis* in the East. That it ever occurs on *Ampelopsis* is of importance in studying the means of preventing the spread of the grape-mildew.

In September, 1883, a *Peronospora* was found on *Geum rivale* by Mr. Seymour and myself at Wellesley and Newton, Mass. The conidiophores were like those found on *Geum album* at Wood's Hall, and were sparsely scattered over the leaves. Unfortunately no oospores were found, but in other respects the species agrees sufficiently well with *P. Potentillæ*. I found, in 1882, a small *Peronospora* on *Ribes Cynosbati* at Wood's Hall, Mass., but the material was too poor to warrant a description.

[2] The terminal conidia are said, by Tulasne, in some cases to produce tubes.

nigra, *Turritis* sp. *Rhaphanus sativus*, *Sisymbrium officinale*, and *Nasturtium Armoracia*.

Everywhere common. Europe.

The common white rust on cruciferous plants, distorting the leaves, stems, and even the floral organs. I have found oospores in the stems and pedicels of *Sinapis* and *Raphanus*. Although extremely common on *Capsella* and *Lepidium*, I have not seen oospores in those plants in this country.

33. C. CUBICUS (Strauss) Lév.

Uredo cubica Strauss Ann. Wetterauer Gesell. II. 86.
C. cubicus Lév. l. c.; De Bary l. c. 128 Pl. II. f. 17-21; Bull. Buss. Inst. I. 429; 25th Rept. N. Y. Bot. 91; 29th Rept. 76; 30th Rept. 77.
C. spinulosus De Bary l. c. 129; 29th Rept. N. Y. Bot. 51.
Exs. Ellis, N. A. F., no. 206.

Conidia of two kinds, the terminal ones larger than the others, depressed-globose, the others short cylindrical (squarish in optical section), with a thickened transverse ring. Oospores brown or black, globose, exospore covered with a fine, scarcely-raised net work.

On *Tragopogon porrifolius*, *Ambrosia artemisiæfolia*, *Parthenium integrifolium*, *Cirsium arvense*.

Massachusetts to Iowa. Europe.

I have found oospores on all the hosts just named, and they all, as well as those in European specimens, of which I have examined a large set, have an exospore which at first sight appears to be granular, but which, on close examination, proves to be covered with a slightly raised net-work, with very small meshes. In this respect European and American specimens of *C. spinulosus* agree perfectly with *C. cubicus*, and the two forms should be united. Probably the species appears on several other composites in this country. It is, however, by no means certain that the *Cystopus* on *Convolvulaceæ*, viz.: *Ipomæa edulis* in Myc. Univ. 815, *Convolvulus* in Ravenel Fung. Am. 501, and apparently not rare from New Jersey (Halsted) on *Ipomæa* to North Carolina, on *Ipom. pandurata*, *Ipom. trichocarpa* and Ohio belongs to the present species. The conidia are subcylindrical, and resemble those of *C. cubicus*, but I have never been able to find oospores in the numerous specimens which I have examined, and without them one can not determine the species with any degree of certainty. The *Cystopus* on *Convolvulaceæ* is apparently the *Æcidium Ipomææ panduranæ* Schweinitz's Syn. Fung. Car. No. 454, and it is to be hoped that some person will find the oospores, which should be sought in the stems and petioles rather than the leaves. In this connection I would call attention to the fact that a *Cystopus* was found on cotton leaves, in Alabama, by Prof. C. V. Riley, in 1879. The discovery is of great practical importance, although, as there were no oospores, the species could not be determined.

34. C. BLITI (Bivon.) Lév.

Uredo Bliti Bivona-Bernard in Stirp. Sic. III. 11.
Caeoma (Uredo) Amaranthi Sch. Syn. Fung. Am. Bor. no. 2853; Grevillea III. 58: 28th Rept. N. Y. Bot. 61.
Cyst. Bliti Lév. l. c.; De Bary l. c. 127, Pl. XIII. f. 13-15; Bull. Buss. Inst. 429 in part.
Exs. Myc. Univ. 619; Ellis N. A. F. 206.

Conidia of two kinds, the terminal subglobose, generally smaller

than the others, which are rounded cylindrical, somewhat truncate at the base, with a thickened transverse band. Oospores globose, exospore brown or blackish, covered with ridges which usually unite to form a net-work, some of the ridges projecting into the center of the meshes.

On *Amarantus hybridus*, *A. retroflexus* and *Acnida cannabina*.

Everywhere common east of the Mississippi. Europe.

I have examined a very large number of specimens of this species which abounds on species of *Amarantus*, and which, with us, produces oospores abundantly in the leaves where they are plainly visible to the naked eye, and I can see absolutely no specific difference between our forms and that on *A. Blitum* of Europe. I have compared oospores on our species of *Amarantus* and *Acnida*, and they correspond precisely to those in Rabh. Fung. Eur. no. 598 on *A. Blitum*, and, in all, the exospore is covered by ridges which unite to form an irregular net-work whose meshes are considerably larger than in *C. cubicus*. The ends of some of the ridges project into the areolæ and terminate in blind ends. The species is apparently much more common in America than in Europe.

35. C. Portulacæ (DC.) Lév.

Uredo Portulacæ DC. Fl. Franc.
Caeoma (Uredo) candidus S. Fung. Am. Bor. in part.
Cyst. Portulacæ Lév. l. c.: De Bary l. c. 127, Pl. III.
Exs. Ravenel Fung. Am. 500.

Conidia of two kinds, the terminal umbilicate and larger than the others which are cylindrical, and without a thickened transverse band. Oospores as in *C. Bliti*.

On *Portulaca oleracea*.

With the last. Europe.

Everywhere abundant on *Portulaca oleracea* and scarcely to be distinguished from the preceding species. The oospores are the same in both, as I am convinced from a large number of examinations, and, although the terminal conidia in one species are larger, and in the other smaller, than the rest, and the transverse band is wanting in *C. Portulacæ*, according to several writers, yet, from my own observations, I have not found these marks to be constant. Neither is the fact that the sori are sometimes concentrically arranged in *C. Portulacæ* characteristic for the same arrangement is not unfrequently seen in the form on *Amarantus*.

I would return my thanks to the following botanists who have kindly furnished specimens of *Peronosporeæ*: J. C Arthur, Prof. C. E. Bessey, Prof. T. J. Burrill, Hon. G. W. Clinton, F. S. Earle, J. B. Ellis, B. D. Halsted, Dr. H. W. Harkness, E. W. Holway, C. H. Peck, H. W. Ravenel, A. B. Seymour, Prof. V. M. Spalding, Prof. Wm. Trelease.

Erratum.—On page 312 after Section III for *Plasmatoraræ* read *Plasmatoparæ*.

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GENERAL NOTES.

Sections of Wood Arranged for Instruction in Schools, by H. Brooks, of Boston, are offered to the students of botany and others interested in the knowledge of our timber trees. The collection contains seventeen species of woods, each in three specimens, a radial, tangential and a transverse section, each 5½ by nearly 2 inches wide and, according to the character of the wood, $\frac{1}{50}$ to $\frac{1}{100}$ inch thick. The three different sections of each species are mounted on a neat card-board and are on both sides protected by a thin and completely transparent mica plate, so that dust and use can not injure them and they can be readily examined with transmitted as well as reflected light; with a good magnifying glass they show the wood structure very nicely.

There are seventeen species of wood in each set, which is furnished in a neat box, at $5.00; application to be made to Henry Brooks, 97 Beacon street, Boston, Mass.

The specimens are similar to those furnished by Mr. Burkart of Brünn,

Austria, but they are not protected by mica and are therefore more liable to injury.

In a hasty examination of the specimens, Catalpa wood is found with a few accessory lines which readily might be mistaken for annual rings, but for the want of the pores always accompanying the vernal wood in this genus. Such accessory rings (false annual rings) are rare in the woods of our temperate climate, but in a specimen of *Pinus Elliottii*, of South Florida, I find such rings quite numerous, and difficult to explain and to distinguish from true annual rings. In wood of the same species from farther north no such appearance is observed, the annual rings being clear and well marked.

If sufficient encouragement be given it is proposed to continue the work, so that sections of all our more important forest trees may be furnished.—GEORGE ENGELMANN.

Morphology of Spines.—In an illustrated paper lately laid before the German Botanical Society, Dr. J. Urban, of Berlin, proves that the spines of *Aurantiaceæ* are not, as has been generally assumed, abortive branchlets, such as we find in *Cratægus*, *Gleditschia* and many other ligneous plants. He shows that they are the abnormally developed basal leaves or bud scales of the axillary bud. A pair of these scales is found on both sides of the bud; sometimes both of them are developed into spines, and then the small bud itself is found between and a little above them. In other cases the scales are unequally developed into a small and a larger spine, but more frequently only one of them grows out into a spine. In this latter case the spine assumes an almost axillary position, and the rest of the bud, with the other lateral (originally opposite) minute scale, is pushed sideways and upwards, so that it assumes the position generally ascribed to it by those who have treated on this subject, seemingly above the spine, thus simulating a secondary bud above the primary one, which would be the spine. But the bud will always be found a little sideways of a line drawn from the center of the axil upwards, and the other lateral bud scale can always be discovered on the other side of the bud. Where there are a pair of unequally developed spines the case becomes quite plain.

In connection with this and other strange developments of different organs into spines, it occurred to me that my observations on the morphology of the spines of *Fouquiera*, made nearly thirty years ago, seem to have escaped botanists: though I have often spoken of them, I have never published anything about them.

A small specimen of *Fouquiera splendens*, sent to me from New Mexico, vegetated well enough for many months, continuing to make its fasciculated spatulate subsessile leaves from the undeveloped branchlets in the axils of the spines, without showing any further growth, till after a heavy thunderstorm and rain with sultry weather, a vigorous shoot sprang suddenly from one of the uppermost of these axils and developed scattered leaves of the same form, but larger, and borne on long (say ½ inch long) horizontal petioles, while the leaf-blade was nearly erect. In the fall these leaves began to wither and to fall, but not, as

one might have expected, at the insertion of the petiole on the axil, nor at the junction of the blade with the petiole; the withered upper half of the petiole separated from the persistent indurated under part in a diagonal plane, so that this indurated part was stoutest at its insertion on the axis, and ran out into a sharp point, while the deciduous part of the petiole was thickest at its connection with the blade and fell off with it, leaving a spine which persists as long as the stem does and which from its axil produces the short spurs with their fasciculated leaves mentioned above. The formation of these different axes and their leaves resembles that of *Larix*, but the morphology of the spines is, as far as I know, quite unique.—G. ENGELMANN.

Helianthus Maximiliani.—The occurrence of *Helianthus Maximiliani*, Schrad., far north of the range assigned it in the books, is worthy of note. Two years ago it was reported from Northwestern Iowa (cf. Contr. to Fl. of Iowa, V, in Davenport Acad. Sci, June, 1882, and Cratty, in Bot. Gaz. VII. 85), previous to which time it had not be n noted north of Lawrence, Kansas. Last August it was recognized by the writer in Minneapolis and, according to Mr. Warren Upham, the Assistant State Geologist of Minnesota, extends northward into the Red River Valley, where it is particularly luxuriant. Its eastern limit in Iowa is some distance west of the middle of the State, not reaching Des Moines, Ames or Mason City. This extended range of a large and showy sunflower originally thought to be exclusively southern, naturally excites some suspicion of the identification; but it is vouched for by no less an authority than Dr. Gray, who has seen Minnesota specimens.—J. C. A.

Nectar Glands on Leaves.—Noticing Prof. W. W. Bailey's inquiry as to the function of the nectar secreting glands at the bases of the leaves of *Cassia Chamæcrista*, to which the ants pay so much attention, I transcribe the following from "Flowers and Their Unbidden Guests:" A. Kerner, English translation, pages 138–9. "* * * what they would have sought, and moreover would have found, in the flower, is already offered them here in rich abundance. The creeping insects are not fastidious. Nectar in one place is the same to them as nectar in another. They are content with that which is first offered, and so do not trouble themselves to climb farther up to the flowers. In *Impatiens tricornis* the stipules are so frequented by *Myrmica lævinodis*, Nyl., that I have often seen three of these ants upon a single stipule; and yet, though I have examined hundreds of plants of this species, and though its nectariferous flowers have no other protection whatsoever to keep out these little creatures, I have never seen a single ant inside a blossom. They would, indeed, be very unwelcome guests, inasmuch as they could reach the nectariferous spur without coming in contact with the pollen; or, at a later stage of flowering, with the stigma. They would thus consume the nectar without profit; and not only so, but by diminishing the attraction would limit and hinder the visits of those insects, which, being larger and coming on the wing, would, in entering the flower, necessarily come into due and successive contact with the pollen and the stigma. As with *Impatiens tricornis*, so is it with other plants where nectar is secreted on he leaves. Though these leaf formations may present no mechanical hin-

drance nor offer any insurmountable barrier to small, creeping ants, they yet serve to divert such visitors from the flowers, and detain them from further advance. I do not therefore hesitate to interpret all nectar-glands that are found on leaves, as a means of protection against the unwelcome, because unprofitable, visits of creeping insects."—J. J. DAVIS, *Racine, Wis.*

One-leaved Strawberries.—The one-leaved strawberry, *Fragaria monophylla, L.*, is recognized as a variety only of *F. vesca, L.* If my memory serves me truly, Duchesne refers to a one-leaved strawberry also. At the New York Agricultural Experiment Station we have seedlings from the Bidwell and Manchester varieties, which show plants distinctly one-leaved, other plants with petioles bearing one, two and three leaflets, and yet other plants of the normal character.

While speaking of strawberries let me call attention to what Miss Bird, that interesting and accurate traveler, says in her "Unbeaten Tracks in Japan," page 45: "Lieut. Hawes gave us some strawberries, which have lately been introduced, and they had a good flavor; but people think they will soon lose it, as other exotic fruits have done before them. A day or two ago we had some fully ripe strawberries of a pale pea-green color, with a strong odor and flavor, not of strawberries, but of the Catawba grape."—E. LEWIS STURTEVANT.

EDITORIAL NOTES.

DR. C. C. PARRY is now residing at Davenport, Iowa.

DR. OSWALD HEER, of Zürich, Switzerland, the celebrated paleontologist, and eminent authority on fossil botany, is dead.

THE CANADIAN NATURALIST has been discontinued by the Nat. Hist. Society of Montreal, which will at once begin the publication of its transactions in a similar form.

DR. GRAY points out in the Am. Jour. Sci. for October that the spelling *Speiranthes* for the orchid-genus *Spiranthes* in Watson's "Contributions XI," is purely accidental, although occurring six times besides in the index.

IT SEEMS from the investigations of Julius Wortmann, given in the *Botanische Zeitung*, that radiant heat acts upon growing organs in a similar manner to the action of light, producing positive and negative thermotropism.

PROF. LESTER F. WARD, of Washington, has recently collected a fine set of fossil plants in the valley of the Yellowstone, near Glendive, Montana. In the number, perfection and rarity of the specimens, it is the best ever obtained in the country.

THE BIOLOGICAL LABORATORY of Wabash College, at Crawfordsville, Ind., now nearly completed, will greatly facilitate the study of botany at that institution, and is expected to give another center for the pursuit of original investigation. The botanical portion consists of a laboratory for general and one for special work and the herbarium room.

THE BRITISH ASSOCIATION has granted $4,300 for promotion of scientific investigation in biology the coming year, not a penny of which goes to botany. Of this sum $750 is absorbed in bibliographical work in zoology. Is botany without wants or without advocates?

PROF. S. A. FORBES is studying the diseases of caterpillars at the Illinois State Laboratory of Natural History, and finds that some native species are infested with *Micrococcus bombycis*, the silk-worm disease, while the cabbage-worm (*Pieris rapæ*) is attacked by a still more deadly Micrococcus.

MR. MEEHAN, editor of the *Gardeners' Monthly*, made an extended trip through Alaska during last July. He reports a climate and soil equalling that of England, in which cauliflowers and most other common garden vegetables do well. Wild fruits, such as crabapples, strawberries, raspberries, blackberries, black currants, gooseberries, huckleberries and juneberries, some sorts of a superior quality, abound.

SAPORTA and MARION, in their work on the paleontological development of the plant-kingdom, consider that the cryptogams find their highest development in the heterosporous *Lepidodendra* of the carboniferous period and then degenerate into the small *Selaginellæ* and *Isoetæ* of the present time. The main line of direct descent from the protophyta was not continued, but distanced and overpowered by gymnosperms which had already appeared in the carboniferous.

M. JEAN DUFOUR recently gave an account before the Société Vaudoise of a fungus, which he names *Torula spongicola*, found on toilet sponges in daily use. It encrusts the surface of the sponge either partially or wholly to an ultimate depth of 5 to 10 mm., with a soft black more or less granular layer, consisting largely of the conidial spores with bacteria in zooglœa state and some organic débris. Using the sponge does not dislodge it, and soap has little or no effect upon its growth. Culture on gelatine under the direction of Dr. DeBary met with no success.

CASSINO'S SCIENTIFIC AND LITERARY GOSSIP, published at Boston, closes its first volume of twelve numbers with the issue for October 15. The announcement for the coming year promises an increase in size to 24 pages, warranted by increased facilities for obtaining the latest news and opinions, a change of name to Science Record, being more exclusively devoted to the natural and physical sciences, and an advance of the annual subscription to one dollar. It is well printed and edited, and fully worth the price asked. Botanists will find many notes of interest in it.

MR. W. F. BUNDY gives a partial list of the the fungi of Wisconsin in the Geology of Wisconsin, Vol. I, enumerating about 300 species, of which over 80 belong to the genus *Agaricus*. The classification is that of Cook's Handbook, which, owing to the rapid advance of our knowledge, is really quite antiquated. It looks strange to see such extreme forms as the puff-balls and slime-moulds brought into juxtaposition, and to find *Ustilago*, *Cystopus* and *Uredo*, all in one

order. We believe it would be better to omit the names of orders and families, and let the species stand in a continuous list, when found impracticable to give later and more natural classification. Three new species are described: *Panus tomentosus*, *Boletus radicosus*, and *B. lateralis*.

MR. G. D. SWEZEY gives, in the first volume of the Geology of Wisconsin, a list of the vascular plants of the State. The author remarks in a prefatory note that he has not been able to follow the "rule of including only such species as have passed under his eye or are preserved in herbaria accessible to the botanist," and for just this reason it is of the slightest possible specific value, although it is obvious that the author has been conscientious in the compilation. If following the "strict and better rule" just referred to abridges a list so much as to present but an imperfect view of the vegetation of the State, why not indicate every unverifiable addition by a difference in type, an asterisk, or other device? This would give a residuum of real scientific value, and not materially interfere with the length or appearance of the catalogue. Mr. Swezey's list is in other respects an excellent one, full and with synonymy brought down to date. He desires corrections and additional information with a view to future publication.

THE LENS, an illustrated octavo journal published in 1872--73, by the State Microscopical Society of Illinois, contains many things of permanent value to the botanist. It was discontinued at the end of the second volume, and since has been difficult to obtain. At the last meeting it was decided to offer the few copies still possessed by the society at half the original price, postage added (published at $3.00 per volume; address the society at 263 Wabash ave., Chicago, Ill.). The longer botanical articles are: Babcock's "Flora of Chicago," full and authentic; Babcock on forms of leaves in "Hepatica," with plate; Samuel Lockwood on "Cultivating wild flowers"; Thomas Meehan "On the agency of insects in obstructing evolution"; various articles by H. L. Smith on diatoms, among them his invaluable "Conspectus of the families and genera of the *Diatomaceæ*," and "The genus *Amphora*," with descriptions and illustrations of the 76 species; S. A. Briggs on *Diatomaceæ* of Lake Michigan, Huron, Rhode Island, etc.; Olney's "Algæ Rhodiaceæ," and others, besides several shorter articles.

THE HISTORY of the spread of the mallow rust, *Puccinia Malvacearum*, Montg., a very destructive disease of the various mallows, especially of *Malva sylvestris* and *Althæa rosea*, is full of interest. The fungus is a native of Chili, and made its first appearance in Europe in Spain, in 1869. In four years it had spread along the Mediterranean coast as far east as Athens, in Greece, and northward through France and the southern portions of Germany and England. In 1874 it invaded northern Germany, in 1875 Ireland, and in 1876 Hungary. Its most northern continental point was, up to the close of last season, at Königsberg in northern Prussia, that is, if we except an accidental occurrence in Finland, in 1874, while the center of its greatest developement is along the Rhine. It has also appeared in Australia and the Cape of Good

Hope, but not yet reported in North America. A very full account of its spread through Europe to 1879, accompanied by a map and bibliography of the invasion, was given by Egon Ihne in the 18th report of the Upper Hessian Gesellschaft für Natur-und Heilkunde.

CURRENT LITERATURE.

To the fringed Gentian, by W. C. Bryant. Illuminated, 8vo. Cassino & Co , Boston, 1883.

This beautiful befringed brochure of a half dozen leaves of heavy card, shows the excellent treatment that has attracted favorable attention to the several large illustrated works on popular natural history issued by this firm. The drawing and coloring of the delicate flower, which is the *motif* to author and artist, together with the decorative setting, is good, although so much can not be said of the head of Bryant which is three times introduced.

Flore de la Suisse et ses origines, par le Dr. H. Christ.

The above work is a volume of 571 octavo pages, sumptuously gotten up, and illustrated by colored maps and full page illustrations. It is in no sense a manual or flora, but a learned and philosophical treatise, most entertaining withal, upon the phyto-geography of Switzerland, and the origin of its plants. It is a wonderful record of patient and careful work, and to the tourist who thinks as well as sees, must be of the greatest value. We hope that many copies may reach this country, where they can not fail to be appreciated.

Flora Peoriana: die Vegetation im Clima von Mittel-Illinois, von Friedrich Brendel. From "Természetrajzi Füzetek," Vol. V. Roy. 8vo, 107 pp. Budapest, 1882.

This is a painstaking and comprehensive account of the flora of Peoria, Ill., written in the German language. The first fifty pages are devoted to topography, climate and general remarks on the vegetation, some idea of the many-sided treatment of which may be gained by naming the headings printed in larger type, as follows: Topography, formation of the soil, result of twenty years observation on the temperature, barometric observations, moisture and precipitation, clouds and sunshine, wind, wind and temperature, wind and clouds, vegetation, the prairies, water, swamp and moist localities, plants of cultivated land, pasture, waste land and roadside, introduced plants, cultivated plants, systematic review of the plants about Peoria and in the State of Illinois. This surely furnishes a deal of data for estimating the value of the various factors which have reacted to determine the presence of the plants of the district. Then comes the catalogue proper, covering forty pages, while the rest of the work is devoted to comparative statistics, and the geographical distribution of the genera and species. The name of each plant in the list is followed by (1) a sign showing if annual, biennial or perennial, (2) the habitat, (3) the abundance or rarity of the species, indicated on a scale of ten by Roman numerals, (4) the relative number of individuals in the proper habitat, indicated on a scale of ten by Arabic numerals, and (5) limits of the distribution in North America; and all this with few exceptions in a single line. At the end of each order is a list of additional plants of the immediate region round about, and of those occurring still further away toward the several points of the compass. The catalogue enumerates 809 species of indigenous vascular plants, and in addition thereto 68 mosses and 19 liverworts with the habitat of each, and a simple list of 36 lichens, 39 fungi, and about 10 algæ. Occasional lapses in proof reading occur, but the general typographical appearance is good. The thoroughness and attention to details merit emulation, although it may rarely be advisable to use so much space for meteorological matters.

ARTICLES IN JOURNALS.

AMERICAN ASSOCIATION FOR ADVANCEMENT OF SCIENCE; botanical papers (notice of each paper read at Minneapolis meeting), *Science*, 2. 333.
BENTHAM & HOOKER.—"Genera Plantarum" reviewed by Ern. Cosson, *Nature*, 28. 485.
BRITTON, N. L.—See under "GERARD" below.
CASPARY, R.—The mallow rust, Puccinia Malvacearum Montg., in Prussia, *Schriften d Phys. Okon. Ges. z. Königs.* 23. 206.
DINGLER, H.—Contributions to the Oriental Flora, *Flora*, July 1.
DUFOUR, J.—Notice of a parasitic fungus on sponge, *Bull. Soc. Vaudoise*, 18. 144.
EATON, D. C.—New or little known ferns of the U. S., No. 14, *Torr. Bull.* 10. 101.
ELLIS, J. B. & B. M. EVERHART.—New species of fungi (10 species), *Torr. Bull.* 10. 97; with W. A. KELLERMAN, New Species of N. Am. Fungi (14 species), *Am. Nat.* 17. 1164.
EVERHART, B. M.—See under "ELLIS" above.
FARRAR, J. A.—Age of Trees, *Pop. Sci. Mo.* 24. 53.
FOERSTE, AUG. F.—Hibernacula of herbs (illustrated), *Am. Nat.* 17. 1107.
GERARD, W. R.—Contributions toward a list of the state and local floras of the U. S., V. The Western States. *Torr. Bull.* 10. 103.
HALSTED, B. D.—Notes on Sassafras leaves (illust.), *Science*, 2. 491.
HANCE, H. F.—Diagnoses of new and habitats of rare or hitherto unrecorded Chinese plants, VIII (2 new species, an Ilex and Rubus), *Jour. Bot.* 21. 295.
HEIMERL, ANTON.—Achillea alpina L. and the forms designated by this name, *Flora*, Aug. 21, concluded Sept. 1.
HOFFMAN, H.—Torrubia cinerea Tul. f. brachiata (with plate), *Flora*, Aug. 21.
HOLMES, E. M.—Rhodymenia Palmetta, var. Nicæensis (with plate), *Jour. Bot.* 21. 289.
INGERSOLL, ERNEST—Tree growth (further illustration of Mr. Kennedy's paper below), *Science*, 2. 569.
JAMES, JOSEPH F.—Dissemination of Phlox, *Science*, 2. 496.
JOSHUA, W.—Notes on British Desmidieæ, No. 2, *Jour. Bot.* 21. 290.
KARSTEN, H.—Contribution to the knowledge of the developement of the Cinchona alkaloids, *Flora*, Aug. 11.
KELLERMAN, W. A.—See under "ELLIS" above.
KENNEDY, W. S.—Influence of winds upon tree growth, *Science*, 2. 470.
KNIGHT, ELIZABETH G.—On the fruit of Eustichium Norvegicum, Br. Eu. (with plate), *Torr. Bull.* 10. 99.
KURTH, H.—Bacterium Zopfii (concluded, with plate), *Bot. Zeit.*, June 29.
MACLOSKIE, G.—The achenial hairs of Townsendia, *Am. Nat.* 17. 1102.
MUELLER, HERMANN.—Review of his "Fertilization of Flowers" (with illustration), *Nature*, 28. 513.
MUELLER, DR. J.—Lichenographical contributions, XVII, *Flora*, June 21, July 1, 11, 21, Aug. 1.
NEUBNER, ED.—Contributions to the knowledge of the Caliciæ (with 3 plates), *Flora*, July 1, concluded July 11.
PAX, DR. FERD.—Flora of the Rehhorn near Schutzlar (continued), *Flora*, June 21, Sept. 1, 11.
REINSCH, P. F.—Upon parasitic, alga-like plants in the Russian leaf-coal, and the nature of the plants which compose the coal (with 2 plates), *Flora*, July 21, concluded Aug. 1; A new algoid type in the Stigmaria coal of Kurakim (Russia) (with 1 plate), *Flora*, Aug. 1; Notice of the stratum of stone coal recently discovered within the Polar Circle, *Flora*, Aug. 11.
SHATTOCK, SAMUEL G.—On the fall of branchlets in the Aspen (P. tremula), *Jour. Bot.* 2. 306.
STEARNS, W. A.—Notes on the Natural History of Labrador, plants (annotated list of 157 species), *Proc. U. S. Nat. Mus.* 6. 126.
WAMSTORF, C.—The peat-mosses of Flotow's herbarium in the Royal Bot. Mus. in Berlin (with one plate), *Flora*, Aug. 21.
WEBER, A.—Notice of Stahl's "so-called compass plants," *Isis*, April. 1883.
WILLIAMSON, W. C.—Vegetation of the carboniferous age (Address before the Brit. Ass. Adv. Sci,), *Science* 2, 529.
WRIGHT, CHAS.—A new Eleocharis (E. diandra, from Conn., resembling E. obtusa), *Torr. Bull.* 10. 101.

BOTANICAL GAZETTE.

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Additions and Corrections to the List of Native Trees of the Lower Wabash.[1]

BY ROBERT RIDGWAY.

Page 50. For No. 8, *Prunus* "*Virginiana*" read *P. Americana.*

Page 53. To the list of 52 species add *Fraxinus quadrangulata* and *Carya microcarpa,* discovered subsequently on the same tract. During a second enumeration made in October, 1882, and restricted to 22 acres of the same piece of woods, 44 species were counted, notwithstanding the fact that 8 acres had been wholly deprived of the underwood and most of the larger trees, while the best timber had been culled from the whole of it. This allows two distinct species of trees for each separate acre of the entire tract. With the consent of the owner of the land, whose intention was to clear the whole piece, selected specimens of all the species were marked for preservation.

Page 57. To the "List of trees attaining a height of 100 feet or more," add, *Quercus Michauxii* (119 feet), *Carya porcina* (115 feet), and *C. microcarpa* (134 feet).

Page 62. *Acer rubrum.* A felled specimen near Wheatland measured 92 feet in length, 31 feet to first limb, and 3 feet in diameter at 3½ feet from the ground; a standing tree in the same locality was 11½ feet in circumference, at 1½ feet, but at 8 feet from the ground divided into two upright forks.

Page 67. *Liquidambar Styraciflua.* Three additional felled trees of this species measured as follows:—*u.* Total length 96 feet, clear trunk 52, circumference 7; *v.* 108, 57½, 8; *w.* 121, 70, 9. The last was felled expressly for measurement.

Page 68. The Tupelo Gum (*Nyssa uniflora*) was omitted. It is abundant in the cypress swamps of Johnson, Pulaski, and

[1] Notes on the Native Trees of the Lower Wabash and White river valleys in Illinois and Indiana. Proc. U. S. Nat. Mus., 1882, pp. 49–88.

Massac counties, Illinois (see Geological Survey of Illinois, vol. i, pp. 408, 411, 430 and 431), and very likely occurs in similar situations near the mouth of the Wabash.

Page 69. *Fraxinus Americana.* Eight slender trees of this species, recently cut for timber in the bottoms of a small creek flowing into the northern end of Mouteur's pond, near Wheatland, were measured in the spring of 1883. Their dimensions were as follows:

Diameter across top of stump.	Height of stump.	Trunk to first limb.	Total length.	No. of annual rings.
2.50	3.00	65.00	108.00	Hollow in center.
2.25	2.50	59.50	106.50	145.
2.33	2.50	47.00	105.50	162.
2.25	3.00	42.00	101.00	168.
2.00	2.00	31.00	100.00	141.
2.85	2.00	62.00	111.00	139.
2.20	2.00	58.00	106.00	.——
3.20	3.50	55.00	127.00	233.
Average 2.45	2.56	52.47	108.12	165.

Page 70. *Catalpa speciosa.* October 29th, 1882, a magnificent Catalpa tree attracted my attention by reason of the marked contrast between its richly green foliage and the decided brown and red tints of the adjacent tree tops. Had it not been thus conspicuous it would probably have escaped notice altogether, although standing not far from the roadside. Careful measurements were made with a tape line, with the following result:

Girth at 1 foot from ground..................................... .....18 feet.
" " 4 feet " " ....12½ "
" " 10 " " " ....10 " 9 inches.
First limb, 1 foot in diameter, growing out at 14 feet from ground.
Second " " " " 30 " " "
Height (determined by several triangulations).............101½ feet.
Greatest spread of branches.......... ....35 and 55 "

Several sprouts or "suckers" had been cut from the base for fence posts.

This tree was again visited May 31, 1883, when it was in full bloom, and clothed with its showy blossoms from the lowest branch to the extreme summit.

The locality was near Turkey Creek, about four miles south of Olney (Richland county), Illinois. A very careful search through the surrounding woods, especially in the bottoms of Turkey Creek, near by, failed to reveal a single additional specimen, of any size whatsoever—so nearly has the species been exterminated in that locality.

Page 70. *Sassafras officinale.* A very fine tree of this species which had been felled in the cypress swamp near White River,

measured 2 feet in diameter across top of stump, and 30 feet to the first limb. The top was measured to 82 feet from the base, but the smaller branches had all been destroyed. The trunk was unusually short, considering the size of the tree, and had been made into fence-posts.

Page 70. *Ulmus alata*. *Very abundant* in bottoms of streams in southern portion of Richland county, Illinois, but no large trees noticed. It grew mostly in company with the Mississippi Hackberry and the usual assemblage of bottom-land trees, the *Catalpa speciosa* having once been abundant, but now quite exterminated in some places and not common anywhere.

Page 77. *Carya alba*. A small specimen measuring only 1 foot 10 inches in diameter at 3 feet from the ground was 96 feet long and 60 feet to the first limb.

Page 77. *Carya microcarpa*. "Heavy, damp soil; scarce. Has very little loose bark, one of our smallest hickories." (SCHNECK.) A specimen growing in Gibson county, Indiana, was 134 feet high, the trunk 70 feet clear and 9 feet 10 inches in circumference at 3 feet from the ground. Another was 14 feet in girth and considerably over 100 feet high. The latter grew on the bank of Greathouse creek, in Wabash county, Illinois, near the town of Mount Carmel.

Page 78. *Carya porcina*. A specimen growing on my father's farm, near Wheatland, measured 7½ feet circumference at 3 feet from the ground, and was about 115 feet high. Another growing two or three hundred yards from the specimen of *C. microcarpa*, the measurements of which are given under the head of that species, in Gibson county, was 10½ feet in girth, the top spreading 99 feet, and the total height not far from 140 feet.

Page 78. *Quercus alba*. A remarkably fine white oak growing in the edge of the bottoms on the "Steen" tract, near Wheatland, Indiana, was not less than 130 feet high, while, by actual measurement, the top expanded 121 feet, the respective extremities elevated not less than 100 feet; the trunk measured 15 feet in circumference, at 3 feet from the ground, and was not less than 40 feet "in the clear."

A white oak tree, standing alongside the Grayville road, about five miles from Mount Carmel, measures 17½ feet in circumference, but the base was somewhat swollen.

Page 80. *Quercus coccinea*. A small tree, recently cut near the edge of Monteur's pond, two miles west of Wheatland, Indiana, was 120 feet long, 30 feet to first small limb, and 2 feet 9 inches in diameter across top of stump, at 3 feet from the ground.

Page 80. *Quercus lyrata.* The largest tree measured stood near the town of Mount Carmel (almost within the corporation), and was 8½ feet in circumference. The height was estimated at between 90 and 100 feet.

Page 81. *Quercus macrocarpa.* A felled tree, in bottoms just above Coffee Creek (Wabash county, Illinois), measured in October, 1882, was 139 feet long, the trunk 87 feet clear, the diameter across top of stump (at 5½ feet from ground) being 4 feet, and only 1 foot less at end of last cut!

Page 81. *Quercus Michauxii.* In the spring of 1883, I found this species very abundant, in fact, the prevailing "white" oak in certian portions of the bottom lands near Wheatland, Indiana. On a tract not exceeding 10 acres in extent, 16 trees, including apparently all of this species growing in that particular locality, were measured, with the following result. Being, with a single exception, all standing trees, it was necessary to estimate the height and length of the trunk:

Circum. at 3 ft from ground.	Length of trunk.	Height.	Spread of top.
12	40 ?	+100	81
14.50	40 ?	+100	......
12.50	55 ?	+100	83
13	29 *	119	......
10.50	50 ?	......	......
14	40 ?	+100	96
11.50	30 ?	......	......
12	50	......	......
10.75	50 ?	......	......
14	40 ?	......	......
10.50	45 ?	......	......
9	50 ?	......	......
12.75	35 ?	......	......
10.25	40 ?	......	......
10	45 ?	......	......
12	55 ?	......	......

Average, 11.83, or nearly 4 feet in diameter.

The general character and appearance of this tree are those of both *Q. Muhlenbergi* and *Q bicolor.* It is most like the former in foliage (which, however, is much more coriaceous, darker in color, and more velvety beneath), but is more like the latter in form, being one of the most robust of all the oaks, while *Q. Muhlenbergi* is decidedly the most slender of the white oak group. In the character of its bark, it is like other species, exceedingly variable, some specimens agreeing exactly in this respect with *Q. Muhlenbergi* while others could not be distinguished from *Q.*

bicolor. I have observed, however, that there is no *certain* rule by which the different species of the white oak section may be invariably distinguished from one another. It is true that each has a more or less characteristic bark in a majority of cases, but individuals of each, perfectly typical so far as fruit and foliage are concerned, are not unfrequently met with, which, if the bark were the only guide, would be unhesitatingly referred to one or another of the other species.

Page 83. *Quercus palustris*. According to Dr. Schneck (BOTANICAL GAZETTE, June, 1883, pp. 242–3), there exists, "within three miles of Mount Carmel," a tree of this species "which commences with two roots," but so close together at the surface of the ground as to appear as one. "The two bodies, however, start separately and are several inches apart for nearly 10 feet, when they unite and form a single trunk, making in all a tree nearly 70 feet high. The two trunks, where they are separate, are about 6 inches in diameter, round, straight, and appear to be solid and perfect."

Page 83. *Quercus rubra*. The largest red oak in North America is said to be in Louisiana, 18 miles from Natchitoches, on the road to Opelousas. It stands in the midst of a rich bottom, on the Bayou St. Barb. Two feet from the ground its circumference is 44 feet, and at six feet it is 32 feet around. The trunk is perfectly sound and 50 to 60 feet to the first limb. (I unfortunately neglected to record the reference to the above information).

What Bartram, in his "Travels through North and South Carolina, Georgia, East and West Florida," etc. (1791), mentions under the name "*Quercus tinctoria*" seems to be this species, rather than the black oak. His remarks are as follows: "To keep within the bounds of truth and reality in describing the magnitude and grandeur of these trees, would, I fear, fail of credibility, yet I think I can assert that many of the black oaks measured 8, 9, 10 and 11 feet in diameter, 5 feet above the ground, as we measured several that were above 30 feet girt, and from hence they ascend perfectly straight, with a slight taper, 40 or 50 feet to the limbs, but below five or six feet these trunks would measure a third more in circumference, on account of the projecting jambs or supports."

Page 83. *Quercus phellos*. In Professor Worthen's "Geology of Illinois," vol. I, p. 433, I read as follows: "North of Brooklyn, Schuyler county, I observed numerous willow oaks (*Q. phellos*), a tree which I have seen nowhere else in Illinois. Part of these woods are open, free of undergrowth, and the ground

nearly bare of grass, others have a dense undergrowth of the same trees."

Page 84. *Castanea vulgaris Americana.* In second paragraph for *March* read *May.*

Page 85. *Fagus ferruginea.* A felled tree, *with decayed top,* measured 84½ feet in length, 32½ feet to the first limb, and 2 feet 8 inches in diameter across top of stump, 3½ feet from ground.

In Southern Indiana, along the line of the Louisville & St. Louis Air Line R. R., are extensive forests where magnificent beeches are among the largest and most abundant trees. In these apparently virgin woods, where this species evidently reaches its finest development, much larger and taller specimens than those I have measured undoubtedly occur.

In my supposition that the beech does not grow on the Illinois side of the river, in Wabash county, Ill., I was mistaken. I have since been shown a fair-sized tree on the bank of Coffee Creek, by Dr. Schneck, who knows of the existence of several others in the same locality.

Page 86. *Populus heterophylla.* In the spring of 1883, an excellent opportunity was afforded the writer for ascertaining the average size attained by this species in a particular locality along the northwestern edge of Monteur's pond, in Knox county, Ind. A considerable number of the larger trees had been cut during the winter, apparently when the pond (here quite shallow) was frozen over. At the time of my visit, in the latter half of April, these felled trees were in *full blossom,* so that the height could be measured very exactly. Only five trees were measured, my time being too limited for further investigations. Following are the measurements taken:

	Diameter acr's top of stump.	Trunk.	Total length.
	1.50	48	72
	1.65	57	76
	1.25	38	75.50
	1.65	53.50	78
	2 *	28.50	77
Average,	1.61	45	75.70

Page 87. For *Populus "tremuloides"* read *grandidentata.* While *tremuloides* may occur, it is quite certain that all the aspens that I have seen are *P. grandidentata.*

Page 87. *Taxodium distichum.* It may interest the readers of

* Diameter at 3½ feet from ground.

the BOTANICAL GAZETTE to know that the largest tree of this species on record grows near the village of Santa Maria del Tule, in the State of Oaxaca, Mexico. The trunk is 118 feet in circumference, or considerably greater than the largest of the California Sequoias, but the height is said to be only 120 feet, or decidedly less than the tallest specimens of this species growing in Indiana. [NOTE.—I find in three different accounts of this tree some marked discrepancies as to the dimensions stated. Thus, in Humboldt's "Travels" the girth is given as 118 feet; an article in Frank Leslie's "Popular Monthly" (vol. v., March, 1878, p. 354) gives the girth as 117 feet 10 inches, while another in the "Popular Science Monthly" makes the following statement: "When Humboldt saw it, in 1851, it measured 42 feet in diameter, 146 feet in circumference, and 282 feet between the extremities of the two opposite branches."]

Page 88. *Pinus mitis.* The interrogation mark should be removed from this species, which has since been ascertained to be the one growing on the hills of Southern Illinois. I have no information respecting the size of this tree as growing in the region referred to, but the following clipping from the *Shenandoah Valley* refers to what is evidently regarded as an unusually large specimen for that portion of Virginia:

"Mr. Samuel Olinger, residing near Quicksburg, Va., a short time ago cut and had sawed into lumber a yellow pine tree, which, we think, is entitled to the appellation of the 'King of the Forest' The result was 2,420 feet of lumber, inch measure. He took 91 feet in length from the tree, and the last cut squared 15 inches. It is thought, had the saw been large enough to cut through the first cuts without hewing them down, the result would have been at least 3,000 feet of inch lumber; the saw cutting only 21½ inches, much had to be hewed off of the logs."

In conclusion, I would like to request those who are interested in the subject to make measurements of large or full grown trees whenever opportunity offers. The woods are fast disappearing, and even in the remnants the finest trees are constantly being culled. There are several species of which we have no satisfactory measurements, and to these attention is particularly directed. They are the following: *Magnolia acuminata*, *Tilia heterophylla*, *Æsculus glabra*, *Æ. flava*, *Negundo aceroides*, *Rhustyphina*, *Robinia pseudacacia*, *Prunus Americana*, *P. serotina*, *Pirus angustifolia*, *P. coronaria*, *Cratægus* (all the species except *subvillosa*), *Amelanchier Canadensis*, *Aralia spinosa*, *Viburnum Lentago*, *V. prunifolium*. *V. dentatum*, *Fraxinus pubescens*, *F. viridis*, *F. sambucifolia*, *Ulmus alata*, *U. fulva*, *Celtis Mississippiensis*, *Carya sulcata*, *Quercus bicolor*, *Q. coccinea*, *Q. falcata*, *Q. lyrata*, *Q. Michauxii*, *Q. nigra*, *Q. phellos*, *Q. stellata*, *Castanea Ameri-*

cana, Fagus ferruginea, Ostrya Virginica, Betula leuta, B. nigra, Salix lucida, S. discolor, Juniperus Virginiana and *Pinus mitis.*

There still exists in the southern part of Indiana (especially in Pike, Dubois and Crawford counties) considerable actually "virgin" forest, in which probably the largest trees now growing in the State are to be found. During a recent trip through this country, over the line of the Louisville & St. Louis Air-Line R. R., I was much impressed with the magnificent growth of beech and other trees, growing densely as possible, and apparently untouched by the ax for miles along the railroad. Saw mills were already established in places, so the work of destruction has begun, and will doubtless continue as long as the material lasts.

Notes on Edible Plants. III.

BY E. LEWIS STURTEVANT.

ANONACEÆ.

This order contains a number of edible and often aromatic plants, and some are in esteem in their native countries, even to the European palate. In tropical Asia the perfumed fruit of *Uvaria Burahol*, Bl., *U. dulcis*, Dun., and *U. heterophylla*, Bl., are eaten (Baillon), in Burma, the fruit of *U. grandiflora*, which has the taste and the appearance of the North American Papaw (Pickering), and in Ceylon that of *U. Zeylanica*, of a vinous taste, and resembling that of an apricot (Don). In Jamaica *U. alba* is said by Lunan to have a fruit eaten when roasted, and in Jamaica *U. dulcis* is grown in the public gardens as a fruit tree (Morris); *U. cordata* is also enumerated amongst the edible species (Masters).

Guatteria cerasoides, Dun., of Western Hindustan, has dark red, cherry size, astringent fruit, eaten by the natives; and the black, fleshy, smooth, acid-sweet berries of *G. sempervirens*, Dun., are also eaten (Don).

The Unonias have aromatic properties. *U. carminativa*, Arrud. affords in the capsules of its seeds a spice relished as a pepper in Brazil (Arruda); *U. discreta*, L. fil. of Surinam, *U. dumetorum*, Dun., of Cochin China, *U. esculenta*, Dun. of India about Madras, have fruits said to be edible and of good taste (Don); those of *U. Corinthi* are also classed as edible (Baillon), and those of *U. undulata*, Dun., are used as a condiment in Guinea.

In the United States we have *Asimina triloba*, Dun., a tree common in the Southern portions, and even extending as far north as Western New York. Its oblong pulpy fruit, about 4 inches long, when ripe has a rich, luscious taste, offensive to many people, but relished by some. It is a natural custard, says Flint, "too luscious for the relish of most people. The fruit is nutritious, and a great resource to the savages." *A. glabra*, L., is found in South Florida, the fruit small and eatable when fully ripe (Vasey).

Monodora myristica, Dun. is cultivated in Jamaica, its fruit called Guinea or Calabash nutmegs, used by the negroes in cooking. It is a native of Africa (Baillon).

Quite a number of the genus *Anona* are cultivated for the sake of their fruits, as *A. Asiatica*, L. of Ceylon (De Candolle) and grown for its fruit in Cochin-China (Unger); *A. Cherimolia*, Mill. of Peru, and its fruit in high esteem. The fruit, when ripe, is of a dark purple, the flesh soft and sweet, enclosing numerous seeds. Cultivated in all warm climates (Baillon), and introduced into Florida before 1877 (Am. Pom. Soc.); *A. cinerea*, Dun., of the West Indies (Don); *A. mucosa*, Jacq. of Martinique and Guiana, and cultivated in the Moluccas, although the fruit seems to be of an unpleasant taste (Don); *A. muricata*, Jacq., the sour sop of the West Indies and neighboring America, in general esteem, and even cultivated in Arabia (Baillon); *A. obtusifolia*, Tuss., cultivated in St. Domingo (Don); *A. reticulata*, L. of the West Indies, and cultivated also in Brazil, the East Indies and the Mauritius (Baillon); *A. squamosa*, L. of tropical America, and now introduced to Cochin-China, China, the Philippines and India. Other species, which are mentioned as bearing edible fruit, but which we have not seen mentioned as cultivated, are *A. chrysocarpa*, whose fruit is eaten in Senegal; *A. longifolia*, of Guiana and Trinidad, and whose fruit was much prized by the Caribs (Unger), and said to be excelled by Lindley; *A. Marcgravii*, Mart. and *A. Pisonis*, Mart. of Brazil (Baillon); *A. paludosa*, Aubl. of Guiana (Unger); *A. palustris*, L., the alligator apple of the West Indies, and Cortissa of Brazil (Don); *A. punctata*, Aubl. of Cayenne, whose fruit is of good flavor and pleasant eating (Lindley); *A. Senegalensis*, Pers., which furnishes one of the best fruits of Sierra Leone, Senegal, and the banks of the Congo (Sabine); *A. sylvatica*, St. Hil. of Brazil (St. Hillaire); and *A. tripetala* of South America, esteemed by Lunan in Jamaica as a delicate fruit.

The genus *Xylopia* has aromatic fruits, and the seeds of many species are used as a spice, as *X. Aethiopica*, A. Rich., the

Guinea pepper employed by the negroes from time immemorial; *X. aromatica*, used by the negroes of Guiana as a nutmeg; *X. frutescens*, used as a seasoner in Brazil (Baillon); *X. glabra* of Jamaica, pronounced by Browne as having an agreeable fruit; *X. grandiflora*, (Baillon), and *X. sericea*, St. Hil., whose seeds furnish a spice in Brazil (St. Hillaire).

The genus *Xylopia* seems to include edible species referred by some authors to the genera *Unona* and *Habzelia*.

BERBERIDEÆ.

This natural order includes a number of edibles of however slight importance.

Lardizabala biternata, Ruiz. et Pav. of Chili and Peru, has fruits which are sold in the markets, the pulp being sweet and of pleasing taste (Don); *Boquila trifoliata* also has edible berries about the size of a pea, eaten in Chili (Maout & Decaisne); and *Holboellia angustifolia*, Wall. of Nepal, and *H. latifolia*, Wall. of Sikkim, have mealy and insipid, yet edible, fruits.

Berberis aquifolium, Pursh. of Western North America, bears sour fruit, but not unpleasant to the taste (Howell); the juice when fermented makes, on the addition of sugar, a palatable and wholesome wine (Rothrock); *B. aristata*, D C. of the mountains of Hindustan, has been introduced into European fruit gardens. It is said to yield purple fruits, which, in India, are dried like raisins and used at desert (Downing); *B. Asiatica*, Roxb., has large ovoid or subglobose berries, red or black, which are eaten in the East Indies (Brandis); *B. buxifolia*, Lam. from Magellan's Straits to Chili, has comparatively large, black, hardly acid, slightly astringent fruit, eaten in Valdivia and Chiloe (Mueller); *B. Canadensis*, Pursh., of the Alleghanies of Virginia and southward, is a small shrub with red berries of an agreeable taste (Pursh.); *B. cristata* of Nepal furnishes fruits which are dried and sent down as raisins to the plains (Wight); *B. Darwinii* Hook. of Chiloe and South Chili, is grown in cottagers' gardens in England, and the fruit esteemed by children as equal to black currants (Gard. Chron.); *B. dulcis*, D. Don, probably the *B. buxifolia*, Lam., has ripened fruit in Edinburg, described as large and excellent (Downing); *B. glumacea*, Spreng. is abundant in spruce forests in Oregon, the fruit blue, acid, but eatable (Newberry); *B. heteropoda* is an edible barberry from Turkistan, and is growing in the Experimental collection of the University of California (Hilgard); *B. lycium* has fruit which in China is preserved, and whose young shoots and leaves are used as a vegetable, or for infusion as a tea (Smith); *B. Nepalensis*, Spreng. of

the Himalayas, is an evergreen species with edible fruit which, dried as raisins, is sent down to the plains for sale (Royle); *B. nervosa*, Pursh., is an Oregon species with edible fruit (Howell); *B. pinnata*, Benth. in New Mexico, has blue berries of pleasant taste, sweet with a slight acidity (Bigelow); *B. repens*, Lind., is common in Utah, where its fruit is highly prized (Jones), and is made into confections and freely eaten (Lloyd); *B. trifoliata*, Gray, of Western Texas, has red acid berries, used for tarts (Torrey); *B. vulgaris*, L. was early introduced into the gardens of New England, and increased so rapidly that in 1754 the Province of Massachusetts passed an act to prevent damage to wheat arising from its presence in the vicinity of grain fields. The leaves were formerly used to season meats with in England (Gerarde); and its fruit is now used for preserves. A stoneless variety is sometimes found. There are four kinds known, the common red, large red, purple and white (Bucke) A black fruited variety is said by Tournefort to occur on the banks of the Euphrates and to be of a delicious flavor. *Bongardia Rauwolfi*, C. A. Meyer, occurs from Greece to the Caucasus. The Persians roast or boil the tubers, and eat the leaves as sorrel (A. A. Black). *Nandina domestica*, Thunb., is a handsome evergreen shrub of China and Japan, and extensively cultivated for its fruit, which are red berries of the size of a pea (Don). *Podophyllum callicarpum*, Raf., is said by Robin and Rafinesque, in their Flora of Louisiana, to have fruit the size of a large filbert, sweet, good to eat, and of which preserves are made; *P. emodi*, Wall. of India, has edible berries, but tasteless (Hooker & Thomson); *P. peltatum*, L., is the May apple, the mawkish fruit eaten by pigs and boys (A. Gray), relished by many persons (Porcher), extremely delicious to most persons (Barton), a pleasant fruit (Newport), but to our taste mawkish and disagreeable.

Forestry Notes.

BY F. L. HARVEY.

Catalpa speciosa, Warder. The distribution of *Catalpa speciosa* is of considerable interest, as it has been the belief of botanists that it is not found native west of the Mississippi river north of the Louisiana line. In a former number of the GAZETTE we gave an account of fine specimens, four feet in diameter, growing in the hotel yard, and in the grounds of Judge A. B. Williams at Washington, Hempstead county. If one was not informed that the seeds were introduced from Louisiana he

would be disposed to regard the species indigenous, as it grows plentifully along the streams in that vicinity. The following from the *Hope Radical* will be of interest:

Mr. John H. Smith was born in 1817, and came to Hempstead county in 1824. In 1831, while a boy of 14 years of age, he carried the mails from Washington, this county, to Natchitoches, La., a distance of 180 miles, on horseback. It required ten days in the saddle to make the round trips, two trips each month. On the Red river he passed a catalpa tree hedge on his frequent trips, and on one occasion filled his pocket with the fluffy seed, and carelessly scattered them in the old court yard in Washington, where they grew, and from that accidental seeding, the catalpa tree owes its present extensive existence in Hempstead county.

If Mr. Smith's account be correct, the oldest trees found in Hempstead county are not over 50 years old, and as there are several about there four feet in diameter, we have another proof that this species makes rapid growth. The trees grow tall and develop a long trunk, which maintains well its size.

It was the impression of botanists that this species occurred native in Southeast Missouri and along the low country of Northeast and East Arkansas, but Mr. John Teas, of Carthage, Mo., who went to that region and investigated, came to the conclusion that it was not indigenous, and that opinion probably still remains.

Not fully convinced, we left the question open in a consideration of the "Forest Trees of Arkansas" in the *Forestry Bulletin* for June. Since the publication of that account investigations in Prairie county, Ark., prove beyond a doubt that it grew in the woods when the country was first settled. Mr. G. W. Letterman informs me that he finds it plentiful in the woods on Black river in Arkansas, considerable timber having been shipped from that region and still plenty of trees remain. Specimens three feet in diameter and 200 years old were secured for the American Museum of New York City.

Cratægus arborescens, Elliott, overlooked in enumerating the Forest Trees of Arkansas in the *Forestry Journal*, is common in the low ground throughout the State, attaining a diameter of 8 inches and a hight of 30 feet.

Cratægus cordata, Ait., common along the streams and swampy places in northwestern Arkansas. Does not bloom until May in this region. Escaped notice until this spring. Attains a hight of 15 feet.

Sophora affinis, Torr. & Gray, credited to Arkansas by the authority of Lindheimer, has been rediscovered by the writer and also by G. W. Letterman in Nevada county, Ark., on the border of prairies near Prescott. Mr. Letterman secured specimens 1 foot in diameter.

GENERAL NOTES.

Notes from Florida.—In a letter to Dr. E. L. Sturtevant, Mr. William S. Allen, Chocaluskee, Monroe county, Florida, writes as follows: "I do not recollect whether in a former letter I ever informed you that many of our annuals are perennials here. One of my neighbors has a fine lot of Lima beans that have been in bearing for three years. They cover a wire fence about 100 yards long. Egg-plant, okra, peppers, cotton, tobacco, all are perennial. As a stalk of tobacco matures the leaves drop off, suckers put out, and in their turn ripen a crop, and it is not uncommon to cut three crops a year from the same land. I do not use the weed, but all my laborers, without exception, smoke and chew, and I find in out of the way places a dozen plants of tobacco growing wild, scattering seeds and holding their own for years without care. Wild cotton grows all around me. Some are standing where I found them when I came here thirteen years ago, and have been full of cotton every year since 1870. . . . . Common Indian pumpkins are perennial, but the Cushaw will only bear one crop, and then dies, as at the north."

It is not usually known that the cow-pea furnishes varieties which are esteemed as human food. Mr. Allen says, speaking of the Whip-poor-will pea, that, "It is generally known among farmers here as six-weeks pea, and is used both as a snap and shell. They are quite palatable. Farmers here make great use of them. In picking we pick partly full-grown pods, and partly mature peas that have not yet become dry. These are boiled together, and are a popular dish."

Melampyrum Americanum.—In July last I found growing on the North Valley Hill, Chester county, a broad-leaved variety of *Melampyrum Americanum*. The leaves are all *ovate* except the lowest pair, which are lanceolate, the uppermost having a minute tooth or two near the base, or very frequently none at all. The most striking peculiarity is that the spatulate cotyledons remain as long as the plant lives. It is so unlike the regular form that it seems hard to call it a mere variety, but on examination and comparison I think it can be nothing more, for of over one hundred specimens collected all maintained the above characteristics fully. The variety seems to have been over-looked by our botanists, for I see no mention of it in Gray. Wood, or the "Flora Cestrica" of Darlington.—S. T. FERGUS, *West Chester, Pa.*

Puccinia heterospora B. & C.—In the September number of *Hedwigia*, Dr. G. Winter mentions a fungus on *Sida spinosa*, collected in Southern Illinois, by Mr. F. S. Earle. It is one of those troublesome species of *Puccinia*, having both one and two-celled spores; and an examination of my own specimens from Mr. Earle shows that in the two-celled spores (which are comparatively few) the position of the septum varies, being either transverse, longitudinal or oblique. In the *Journal of the Linnæan Society* for 1875 is the following description:

Uromyces Thwaitesii B. & Br., Maculis luteis hypophyllis; soris circinantibus

brunneis; sporis obovatis lalvibus longissime pedicellatis. On leaves of *Sida humilis* Willd. and *S. hirsuta*, Peradenia, Jan. 1855, Dec. 1867. There are rarely two cystoblasts parallel to each other.[1]

Dr. Winter has a specimen on *Sida rhombifolia*, from South Africa, and with this he compares Mr. Earle's specimen and finds it to agree. He refers it to its proper genus and calls it *Puccinia Thwaitesii*, (B. & Br.) In the Linnæan Journal, for 1869, is the following:

Puccinia heterospora B. & C. Soris minutis in glomerulos orbiculares congestis brunneis; sporis subglobosis, pedicello deorsum attenuato subæqualibus, demum biseptatis. On the leaves apparently of some malvaceous plant.[2]

I received specimens from Mr. Earle in the fall of 1882, but with the resources then at my command was unable to determine them. More recently I have had access to the Curtis collection and references to the above descriptions. A comparison shows Mr. Earle's specimen to be identical with the original of *Puccinia heterospora*. As I have not seen *Uromyces Thwaitesii*, I can not say whether it is identical with *Puccinia heterospora* or not, but in either case Mr. Earle's specimens must be referred to the latter, which is the older name.

The host of the Curtis specimen is pretty certainly *Sida triquetra*.

In *Grevillea*, Vol. III, Dec., 1874, is described *Uromyces pulcherrima* B. & C. on *Abutilon Texense*, from Texas. I have examined the Curtis specimen and can not distinguish it from *Puccinia heterospora*. The collection also contains specimens labeled *Uromyces pulcherrima* B. & C. on *Abutilon parvulum* and *Anoda hastata*.

A. B. SEYMOUR.

EDITORIAL NOTES.

DR. CARPENTER, at the last meeting of the British Association, illustrated the power living forms have of adapting themselves to environment by the changes in the small-pox bacteria. Formerly the disease was very severe and known as the "black-pox," but at present it exists in a much milder form. During the last siege of Paris, however, the bacteria reverted to the original form and the "black-pox" again appeared.

WE HAVE HAD Kerner showing how plants have contrived to escape unwelcome insect visits, and our respect for plants has been thereby increased, although constructing a reason for everything is not always safe. But Mr. Alexander Wilson has gone farther, and at the British Association suggested that the closed ovary of the Angiosperms was a contrivance for the ovules to escape the attacks of parasitic fungi. That the closing up of the ovules is a hindrance to the action of the pollen can be understood, and to overcome it we find adaptations of tissue, modifications of structure, changes in the positions of ovules, etc. This outlay, Mr. Wilson reasons, is compensated for by some great advantage, which he concludes to be that already mentioned. He likens the closed ovary to Tyndal and Pasteur's sealed flasks, from which are kept all fungus spores,

[1] Berkeley and Broome, Ceylon Fungi, in Journ. Linn. Soc., Vol. XIV, p. 92, 1875.
[2] Berkeley and Curtis, Cuban Fungi, in Jour. Linn. Soc., Vol. X, p. 356, 1869.

even the air which gains admission being filtered through tissues and their secretions. This is one of those subjects which lead to the most tempting generalizations, but should be considered yet more as something interesting than settled.

THE GERMAN SCIENTIFIC EXPEDITION, under Dr. Koch, to investigate the Egyptian cholera has not yet reached any very definite results. The only thing set at rest is that the Bacillus is identical with that found in the case of Asiatic cholera.

WE NOTE that Dr. Farlow has received one of the numerous gold medals awarded by the juries of the late International Fisheries Exhibition, for his work on the marine algæ.

WE WOULD CALL attention to the capital address of Prof. E. Ray Lankester, as president of the biological section of the British Association, upon "The Endowment of Biological Research." It should be in the hands of all the boards of management of our colleges and universities, and may be found either in *Science* or *Nature*.

THE WAY THAT new species of fungi are pouring in upon us is rather overwhelming. Not a month passes without its lists of new species, which leads us to think either that we have never looked much for fungi before, or that specific lines are not yet well drawn.

WE HAVE JUST received notice of the death of Mr. Chas. E. Perkins, of Somerville, Mass. It will be remembered that he published in the GAZETTE for March of this year a list of the "Ballast Plants of Boston and Vicinity." He was a young man and a good collector, his large collection, left to the Middlesex Institute of Malden, being especially rich in introduced and ballast plants. He had in contemplation both a local flora and a garden flora, which his friends may be able to complete from his notes.

WE WOULD call attention to the extension of time given in competing for the GAZETTE prize, November 1 being substituted for May 1.

CURRENT LITERATURE.

Flora of Worcester county, Massachusetts. By Joseph Jackson. Published by the Worcester Nat. Hist. Soc. 1883. 48 pp. 8vo.

This society, but four years old, is doing a good work in bringing before the people of its own neighborhood information upon the various departments of natural history. This is done by placing in charge of its collections, which occupy three rooms, a competent custodian, whose services, not as guide only, but also as teacher, are freely at the disposal of the public. During the past year 20,000 visitors have availed themselves of this privilege. The pamphlet before us is but an outgrowth of this work, and is surely well done. The county extends north and south across the State and contains quite a diversity of surface so that both southern and northern New England may be said to be represented. Only the Phænogams and Vascular Cryptogams are included, not so much from desire, we infer, as from necessity. The list numbers 812 species, belonging to 387 genera. The only criticism that could be made is that there

is no mark to indicate introduced plants. True this work is done in Gray's Manual, but one can not always remember what it says, and may not care to look it up. Now that introduced plants are getting so thoroughly mingled with our indigenous flora, too great care can not be exercised in keeping them apart in our lists, for it is becoming a more difficult thing to do every year.

Catalogue of Canadian Plants. Part I.—Polypetalæ. By Prof. John Macoun. Montreal. 8vo. 192 pp.

This Catalogue is published by the Geological and Natural History Survey of Canada, under direction of Alfred R. C. Selwyn. Heretofore about the the only knowledge of the Canadian flora we have had has come from the "Flora Boreali Americana," Torrey and Gray's Flora and Gray's Synoptical Flora. These works but incompletely represent it; the first from lack of exploration, the others chiefly from the fact that they only include the Polypetalæ and Gamopetalæ. The present Catalogue has been begun quite elaborately, and besides drawing from the sources above mentioned, is based upon very extensive explorations, not the least of which were made by the author himself. Under each species is given its synonymy, habitats and collectors. The range from Alaska to Newfoundland is a tremendous one, but of course in these northern regions the number of species will bear no such relation to area as further south. In the list are included 907 species, under 243 genera, but no attempt is made to separate introduced plants from the indigenous, further than a mention of the fact in the notes. The Rocky Mountain region seems to be the one most needing exploration, for the old collections, good as they were, covered a comparatively small area, and many of their plants need rediscovery. We imagine that such an exploration would result more in the establishment or not of old species than in new species. We certainly hope that the material for subsequent catalogues may speedily be gotten together and the good work pushed to its completion.

Thirty-third Annual Report of the State Museum of Natural History. (Report of the Botanist, Chas. H. Peck.) 50 pp. with two plates. 1880.

Thirty-fourth Annual Report. 58 pp. with four plates. 1881.

These reports are usually quite delayed, but full of new material when they do appear. Mr. Peck, in spite of ill health, seems to be constantly at work. In the 33d Report, besides a general list of "Plants not before reported," in which are many new species of fungi, is a paper upon the New York species of *Amanita*, which number 14, 4 of which are new. The two plates contain the figures of 14 new species, one of them, *Caliciopsis*, being a new genus related to *Tympanis*. In the 34th Report there is the same rich display of new species, and along with them a description of some of our commoner injurious parasites, such as corn smut, etc. The plates are excellent, but in the text sufficient prominence is not given to the specific names, especially of new species.

Report on the Michigan Forest Fires of 1881. No. 1 of Signal Service Notes. By William O. Bailey. Washington. 1882. 8vo. 16 pp. (with map and diagrams).

This gives a full and very interesting account of these great forest fires, a good map of the burned district, and some diagrams showing the principal directions of the fire. The causes assigned are of two kinds, the natural ones being such as prevailing southerly winds, an accumulation of hot air in consequence, an area of low atmospheric pressure north of the fires, opposing winds south of the center, a protracted drought, and dry soil. The "local causes" given are great areas of dead timber left standing, and carelessness of settlers in managing local fires.

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Botanical Gazette for 1884.

VOLUME IX.

The BOTANICAL GAZETTE enters upon its ninth year with a strong constituency, and an increasing determination on the part of the editors to make it a journal worthy the support of every botanist. It is with great satisfaction that we can announce that the generous support of botanists has placed the GAZETTE on a sure financial basis, and that we can look to even greater enlargement. Eight years ago we printed four pages per month, then eight, then twelve, and during this year sixteen or twenty pages have been printed every month and with all these improvements the subscription price has never changed. We believe we can fairly claim to be the largest journal in the world, devoted strictly to botanical science, that can be purchased for one dollar per year.

During the coming year we desire to have all the departments of botany represented in our pages even more fully than ever before, and hope to make the GAZETTE faithfully reflect the botanical activity not only of this country but of Europe. We therefore will welcome notes and papers upon any subject connected with botany, and classification, morphology, physiology, etc., shall all share alike. We can make no better promise for the future than to give the customary list of names of some ot our contributors during the present year, with this statement, however, that the list would have been much longer if all promises had been fulfilled. Following is a partial list of contributors for the current volume:

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GAZETTE PRIZE.

The GAZETTE offers a prize of $50 for the *best life history of any plant*, upon the following conditions: All papers must be sent to the Editor on or before May 1st, 1884, must be the results of original investigation, and must be considered the property of the GAZETTE. Papers must bear no signature other than a word or motto, which should also be written upon a sealed envelope which contains the name and address of the author. The committee of award consists of Prof. C. E. Bessey and Dr. W. G. Farlow, who will appoint a third. The right is reserved of rejecting all papers unless worthy of a prize. The successful paper, as well as all other worthy ones, will be published in the GAZETTE, with all necessary illustrations.

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